

AD-A106 934

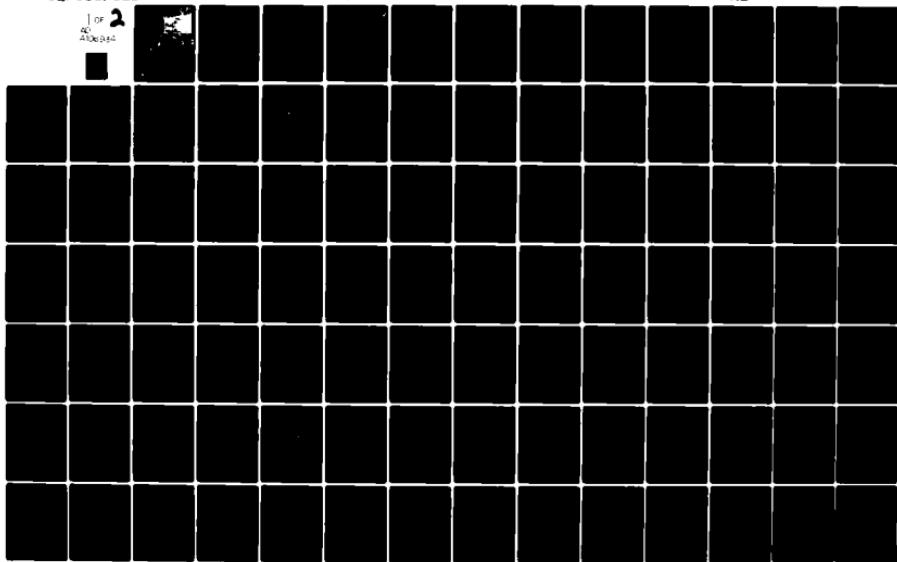
CORPS OF ENGINEERS DETROIT MI DETROIT DISTRICT  
MAINTENANCE DREDGING & CONFINED DISPOSAL FACILITY FOR THE CROOK—ETC(U)  
JAN 80

F/6 13/2

ML

UNCLASSIFIED

1 of 2  
60  
AD-A106 934



AD A106934

FINAL  
ENVIRONMENTAL  
STATEMENT

LEVEL II



MAINTENANCE DREDGING & CONFINED DISPOSAL FACILITY  
FOR THE CROOKED RIVER PORTION OF  
MICHIGAN'S INLAND ROUTE

and

FILE COPY

THE OPERATION, MAINTENANCE, & PROPOSED PUBLIC  
USE FACILITIES FOR THE  
*Alanson Lock and Weir, Michigan.*

U.S. ARMY ENGINEER DISTRICT, DETROIT JAN 80

DISTRIBUTION STATEMENT A  
Approved for public release  
Distribution Unlimited

81 10 30 010

410244

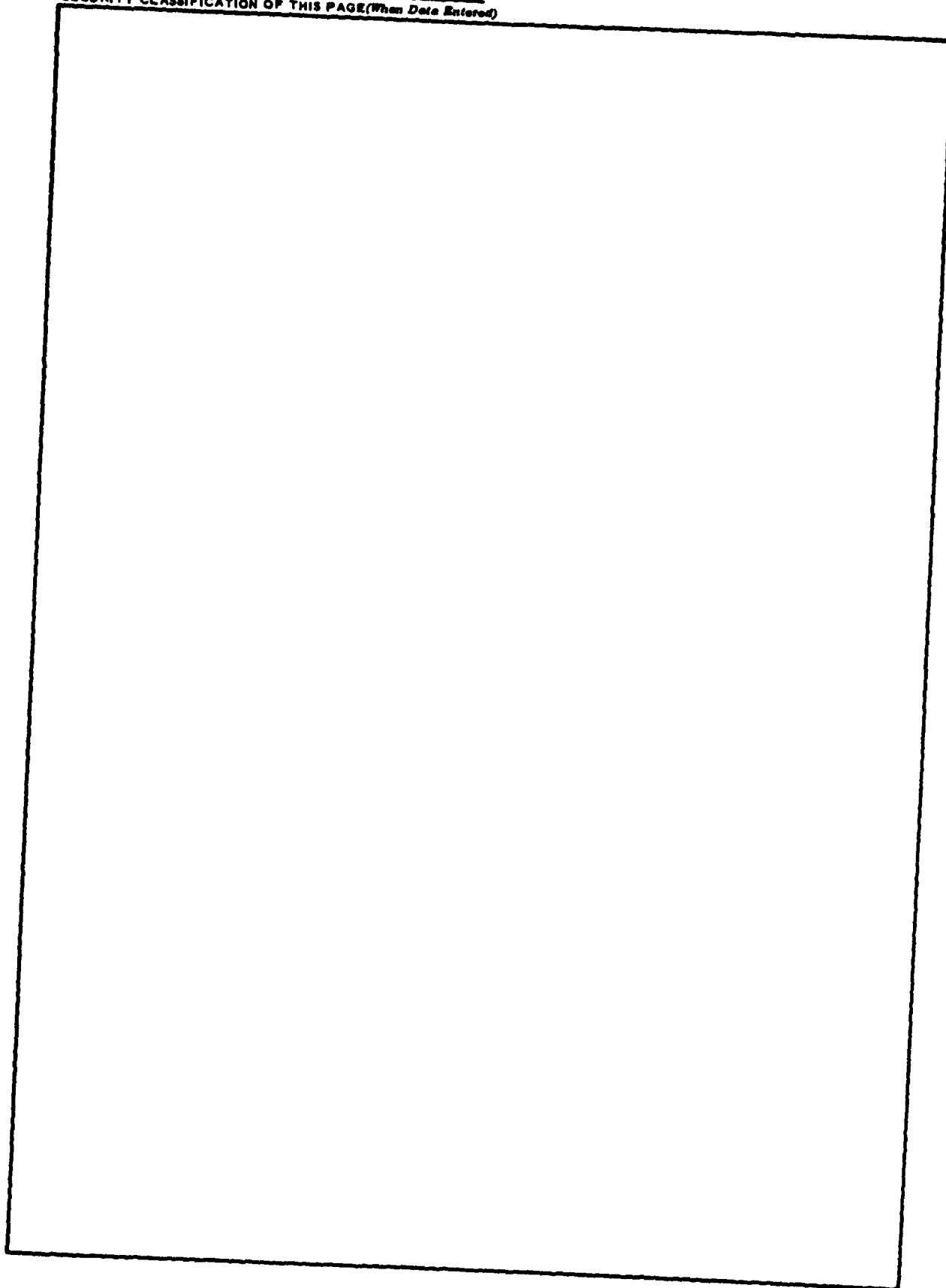
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
		AD-A126 934
4. TITLE (and Subtitle) Final Environmental Statement Maintenance dredging & confined disposal facility for the Crooked River portion of Michigan's inland route and the O&M, & proposed public use facilities for the...	5. TYPE OF REPORT & PERIOD COVERED Final Report	
7. AUTHOR(s)  U.S. Army Corps of Engineers	6. PERFORMING ORG. REPORT NUMBER	
9. PERFORMING ORGANIZATION NAME AND ADDRESS Department of the Army U.S. Army Engineer District, Detroit P.O. Box 1027, Detroit, Michigan 48231	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS	
11. CONTROLLING OFFICE NAME AND ADDRESS	12. REPORT DATE January 1990	
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)	13. NUMBER OF PAGES	
16. DISTRIBUTION STATEMENT (of this Report)		15. SECURITY CLASS. (of this report)  UNCLASSIFIED
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)		

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)



SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

Accession For  
NTIS GRA&I   
DTIC TAB   
Unannounced   
Justification \_\_\_\_\_

PY \_\_\_\_\_  
Distribution by \_\_\_\_\_  
AV \_\_\_\_\_  
Distr : Special

A

SUMMARY

DTIC  
ELECTED  
S OCT 30 1981 D

CONFINED DISPOSAL FACILITY, MAINTENANCE DREDGING, AND  
THE OPERATION, MAINTENANCE AND PUBLIC USE FACILITIES  
FOR THE CROOKED RIVER LOCK AND WEIR OF MICHIGAN'S  
INLAND ROUTE.

( ) DRAFT ENVIRONMENTAL STATEMENT      (X) FINAL ENVIRONMENTAL STATEMENT

RESPONSIBLE OFFICE: U.S. Army Engineer District, Detroit

Corps of Engineers

P. O. Box 1027

Detroit, Michigan 48231

Telephone: (313)226-6752

1. NAME OF ACTION: (X) ADMINISTRATIVE ( ) LEGISLATIVE

2. DESCRIPTION OF ACTION: This statement addresses the Operation and Maintenance of the Crooked River portion of the Inland Route, Michigan, including dredging, dredge material disposal, and the continued operation and maintenance of the Crooked River lock and weir at Alanson, Michigan. Since an upland disposal site would be used, a transfer facility would also be required. Dredged material removed from the Crooked River would be transferred to trucks at the foot of Snider Road at the Crooked River, and hauled to the disposal site, located approximately one (1) mile north on Snider Road. The estimated annual shoaling rate in Crooked River is 1,000 cubic yards, and the river will require about 9,500 cubic yards of backlog dredging.

Thus, the total capacity of the site for 10 years is 19,500 cubic yards. Maintenance dredging is necessary to restore the waterway's ability to accommodate recreational craft navigation. The proposed Federal action also includes operation and structural maintenance of the lock and weir on the Crooked River at Alanson. Structural maintenance and operations are required to insure continuance of vessel passage along the Inland Route. Water level regulation of the upstream rivers and lakes is a function of the lock facilities. Additionally included in the action is the proposed construction of public use facilities at the lock. The plan provides for the construction of a parking lot, restroom facilities, storage building, observation platform and docking area, and landscaping.

3. (A) ENVIRONMENTAL EFFECTS: Construction of the proposed disposal facilities would permit dredging of the Crooked River to maintain a navigation channel 5 feet deep and 30 feet wide. Recreational boaters and associated economic interests could benefit from dredging of the Crooked River. Operational and structural maintenance of the lock and weir at Alanson, Michigan, would also provide for the continuance of the recreational boating on the waterway and water level regulation in the upstream project reaches.

At the present time there exists no parking facilities for visitors, boaters, and fisherman who come to the lock site. This results in a congestion of parked cars along the shoulder of the narrow, earthen access road. The proposed asphalt parking lot would be constructed on an area just west of the lock and would accommodate 25 cars, thereby reducing the confusion of unrestricted parking. The proposed walkway, observation platform, and wood-chip trail would provide the visitor an unobstructed view of lock and weir operations, while preventing any interference.

The placement of dredged material at the final disposal site would permanently alter the existing area. The most dramatic change would be the result of the introduction of a nutrient enriched soil to the area. This "fertilizer" would enhance plant growth and subsequent wildlife populations increases for an area that has been limited by former land use.

(B) ADVERSE ENVIRONMENTAL EFFECTS: Construction and operation of the proposed disposal and transfer sites would result in a temporary degradation of air quality at each site and along the haul route. Water quality in the vicinity of the transfer site would be adversely affected by the increased level of turbidity that is expected to accompany the proposed construction activities. Construction of the transfer site would also temporarily result in a nonconforming use of the area's shoreline.

Water quality would be temporarily affected in the vicinity and downstream of the Crooked River Lock during the infrequent structural repairs to the revetments, weir and lock chamber pilings, and construction of the proposed walkway and observation platform. The impact would be essentially limited to increased turbidity. Impacts to the surrounding terrestrial environment would consist of the loss of vegetation in an area re-established since the initial lock and weir construction, subsequent visitor usage, and by the noise associated with the proposed activities. Long-term impacts attributable to the Federal structures would be the increased development in the watershed brought about by the sustained desirability of the project area for water recreation.

Dredging of sediments from the project waterway would affect the environment in four areas: water quality; benthic regions of the water course; macro-organisms inhabiting or using the waterways; and the temporary impact on the natural setting of the area by the presence of the dredging equipment. Turbidity during actual dredging will restrict biological productivity temporarily, and smothering of adjacent benthic communities may occur. Rooted aquatic vegetation and sessile benthic organisms that have colonized the harbor channel will be removed by the proposed work. Fish inhabiting and/or using the work area would be temporarily disturbed or displaced by the increased turbidity level or the dredging equipment or both.

4. ALTERNATIVES: In addition to the proposed disposal site, alternative solutions are: (1) open water disposal; (2) other diked disposal sites; (3) pretreatment of materials; and (4) no action. The only realistic alternative to maintenance dredging is a "no action" alternative. However, cessation of dredging would lead to an unnavigable waterway, eventually closing the waterway or producing a hazardous navigational problem, because of the accumulation of sediments.

Alternatives considered for the operation, maintenance, and proposed public use facilities are listed below.

(a) Operations Alternatives: The alternatives to continued operations, as proposed, include alternative operation schedules. Nonoperation of the lock would preclude use of the facility for its designed function. Operation of the lock on a different schedule would restrict and limit recreational use of the waterway.

(b) Maintenance of Facility: The alternatives to structural maintenance are the termination of maintenance and partial structural maintenance. Termination of maintenance would result in the eventual deterioration of the structures to a point where they no longer serve their designed purpose. Recreational use of the waterway and water level regulation in the upstream project area would be impaired. Partial structural maintenance would have a similar effect as no maintenance, though a longer time period would be required for project deterioration.

(c) Public Use Facilities: There are two alternatives to the proposed improvements - "No Action" and "Partial Implementation". The former alternative would prevent the impacts associated with the proposed structural improvements from occurring. Economic savings would be made, and construction activities would not adversely impact present use and recreation. Negative impacts from this alternative would be (1) lack of storage facilities for lock maintenance equipment; and (2) lack of rest-rooms, sight-seeing accommodations, and adequate parking for tourists visiting the existing facilities. "Partial Implementation" of the proposed action would allow some improvement of the existing facilities but would reduce those actions considered detrimental to the environment.

5. COMMENTS REQUESTED:

Federal Agencies

Advisory Council on Historic Preservation  
U.S. Department of the Interior  
U.S. Environmental Protection Agency  
U.S. Department of Commerce  
U.S. Department of Agriculture  
U.S. Department of Transportation  
U.S. Department of Health, Education, and Welfare  
Federal Power Commission

State Agencies

Michigan Department of Natural Resources  
Michigan Department of State Highways and Transportation  
Michigan Department of State - Michigan History Division  
Michigan Department of Agriculture  
Michigan State University - Conference of Michigan Archeology  
Michigan Department of Commerce

Local Agencies

City of Alanson and Citizens  
Emmet County  
Maple River Township Supervisor  
University of Michigan Biological Station

Environmental - Civic Groups

Michigan United Conservation Clubs  
Historical Society of Michigan  
National Audubon Society  
Izaale Walton League  
Sierra Club  
Michigan Student Environmental Conference  
Michigan Audubon Society  
Michigan Natural Areas Council

6. DRAFT STATEMENT TO EPA 31 MARCH 1978.  
FINAL STATEMENT TO EPA \_\_\_\_\_.

## TABLE OF CONTENTS

<u>Section</u>	<u>Title</u>	<u>Page</u>
<b><u>SUMMARY</u></b>		<b>1</b>
I.	PROJECT DESCRIPTION	1
A.	General	I-1
B.	Authorization	I-2
C.	Description of the Proposed Project	I-3
	Dredging and Disposal	I-3
	Alanson Lock and Weir Operation and Maintenance	I-12
	Public Use Facilities	I-12
D.	Dredged Material Characteristics	I-13
II.	ENVIRONMENTAL SETTING WITHOUT THE PROJECT	II-1
A.	Area Description	II-1
B.	Climate	II-1
C.	Geology and Topography	II-3
D.	Soils	II-6
E.	Hydrology	II-9
	Surface Water	II-9
	Groundwater	II-9
F.	Vegetation	II-9
G.	Wildlife	II-13
H.	Fisheries Resources	II-15
I.	Threatened and Endangered Species	II-15
J.	Air Quality	II-18
K.	Water Quality	II-18
L.	Demographics	II-22
M.	Land Use	II-23
N.	Archeology	II-23
O.	Sociology and Economics	II-25
III.	THE EFFECT OF THE PROPOSED ACTION ON LAND USE PLANS	III-1
IV.	PROBABLE IMPACT OF THE PROPOSED ACTION ON THE ENVIRONMENT	IV-1
A.	General Impacts	IV-1
B.	Dredging Impacts	IV-4
C.	Disposal Impacts	IV-6
D.	Transfer Site	IV-8

TABLE OF CONTENTS (Continued)

<u>Section</u>	<u>Title</u>	<u>Page</u>
E.	Public Use Facilities	IV-8
F.	Relationship to Other Navigation Projects in the Vicinity	IV-10
G.	Conclusion	IV-10
V.	UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS	V-1
VI.	ALTERNATIVES TO THE PROPOSED ACTION	VI-1
A.	Open Water Disposal	VI-1
B.	Alternative Diked Disposal Sites	VI-1
C.	Pretreatment	VI-4
D.	No Action Alternative	VI-4
VII.	RELATIONSHIP BETWEEN SHORT-TERM USE OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY	VII-1
A.	Short-Term	VII-1
B.	Long-Term	VII-2
VIII.	IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES WHICH WOULD BE INVOLVED SHOULD THE PROPOSED ACTION BE IMPLEMENTED	VIII-1
IX.	COORDINATION, COMMENT, RESPONSE	IX-1

REFERENCES

GLOSSARY

APPENDICES

CONFINED DISPOSAL FACILITY, MAINTENANCE DREDGING: AND  
THE OPERATION, MAINTENANCE, AND PUBLIC USE FACILITIES  
FOR THE CROOKED RIVER LOCK AND WEIR OF MICHIGAN'S  
INLAND ROUTE.

1. PROJECT DESCRIPTION

A. General

1.01 Maintenance dredging of the navigable waterways in the Great Lakes is performed by the U.S. Army Corps of Engineers as authorized by Congress. An average of 12,000,000 cubic yards of sediments must be removed per year from 64 harbors and 157 miles of improved channels. The purpose of the maintenance dredging is restoration of authorized depths in the established projects. These waterways provide vital transportation routes for bulk materials, economic stimulus, and increased opportunities for recreational utilization of water resources.

1.02 The River and Harbor Act of 1970 (Public Law 91-611, Section 123) authorizes the construction, operation, and maintenance of confined disposal facilities for dredged material unsuitable for open lake disposal for maintenance dredging of navigation channels for a period of ten years. In 1970, the Governor of Michigan requested the Corps of Engineers to cease disposal of dredged material unsuitable for open lake disposal to waters of the Great Lakes in Michigan. The Regional Administrator of U.S. Environmental Protection Agency (EPA) is authorized to determine whether sediments are to be considered unsuitable for open lake disposal.

1.03 Sediments from the Crooked River portion of the Inland Route, Michigan were investigated by the EPA (Region V) during October 1975. Data developed during these investigations and the locations at which samples were collected are shown in Appendix A. Considering all the data, the EPA Regional Administrator classified all sites sampled as unsuitable for open lake disposal. Therefore, sediments dredged from the Crooked River between Burt Lake and Crooked Lake must be placed in a confined disposal area.

1.04 Dredging of the Crooked River waterway is required to maintain this navigation channel at a depth that would provide for safe vessel passage. The need for a five (5) foot depth is exhibited by the type and size of vessels currently using the waterway. Review of lockage logs kept of the 1968-1978 operating seasons for the Alanson Lock showed that power boats up to 30 feet

in length used the lock facilities, 44 percent of which were longer than 17 feet. In addition, data collected from the Michigan Department of Natural Resources (MDNR) and the U. S. Coast Guard, comparing vessel lengths to drafts, indicate that vessels in the 16 to 30 foot class draw between 3' and 3' 10" of water. From this information it would appear that a practical maximum draft would be about 4 feet. However, considering the normal 1/2 foot overdepth associated with dredging and the proposed maintenance interval of five years, the five foot project depth can be justified as a minimum requirement for safe navigation along the Crooked River. Please refer to Appendix F for the vessel data.

1.05 The project encompasses:

1. The maintenance dredging of shoaled sediments from the Crooked River portion of the Inland Route, Michigan, which includes Crooked Lake and the Picker 1 Lake Channel.
2. The construction of a disposal facility for containing or storing the sediments. This includes all other structures (i.e. transfer site, riprap, mooring piles, etc.) necessary for removal of the sediment to the disposal site.
3. Operation and maintenance of the lock and weir structures on the Crooked River at Alanson, Michigan.
4. Construction of the proposed public use facilities at the Crooked River Lock.

B. Authorizations

1.06 Prior to 1948, there was no Federal work within the waterway designated as the Inland Route, Michigan. In 1948, the Corps of Engineers performed emergency channel improvement work in the Inland Route under authorization of Section 8 of the River and Harbor Act approved 2 March 1945. Snags were removed and a channel 4 feet deep and 30 feet wide was dug through shoaled areas in the Crooked and Indian Rivers.

1.07 The existing project was authorized by the River and Harbor Act of 3 September 1954. Construction was initiated on 29 October 1956 and completed on 2 May 1958. The project provides for a channel 5 feet deep and 30 feet wide, with necessary widening at the bends, through Crooked and Indian Rivers. The project also includes placement of 600 linear feet of jetty at the head of the Cheboygan River on Mullett Lake which was completed on 13 November 1959. In addition, a lock and weir facility on the Crooked River at Alanson was approved by the Chief of Engineers in 1964 to correct a design deficiency. Construction of the lock and weir facility was completed in 1968.

1.08 Federal facilities at Alanson, Michigan consist of: (1) a lock chamber, (2) the steel sheet pile weir, (3) a stone dike, (4) the shelter building, and (5) a parking and service area with an adjoining service road. Maintenance is performed, as required, to keep the structures operationally sound and in good condition. Only "in-kind, in-place" repair is authorized.

1.09 Master planning for needed improvements in operation of the Crooked River lock and weir and accomodation of sightseers was initiated in the spring of 1976. A master plan has been prepared and approved (August, 1977). The proposed activities include construction of a parking lot, restroom facilities, storage building, observation platform, and docking area for maintenance boats. Real estate would have to be secured prior to project initiation.

1.10 The total Federal costs for the existing project as of 30 June 1974 are as follows:

	<u>EXISTING PROJECT</u>	<u>PREVIOUS PROJECT</u>
New Work	\$ 770,222	\$ 0
Maintenance	<u>588,454*</u>	<u>\$ 0</u>
TOTAL COSTS	\$1,358,676	\$ 0

\*Excludes \$148,000 Contributed Funds.

A summary of the proposed project costs, both Federal and non-Federal, and expected annual costs, can be found in Appendix G.

#### C. Description of the Proposed Project

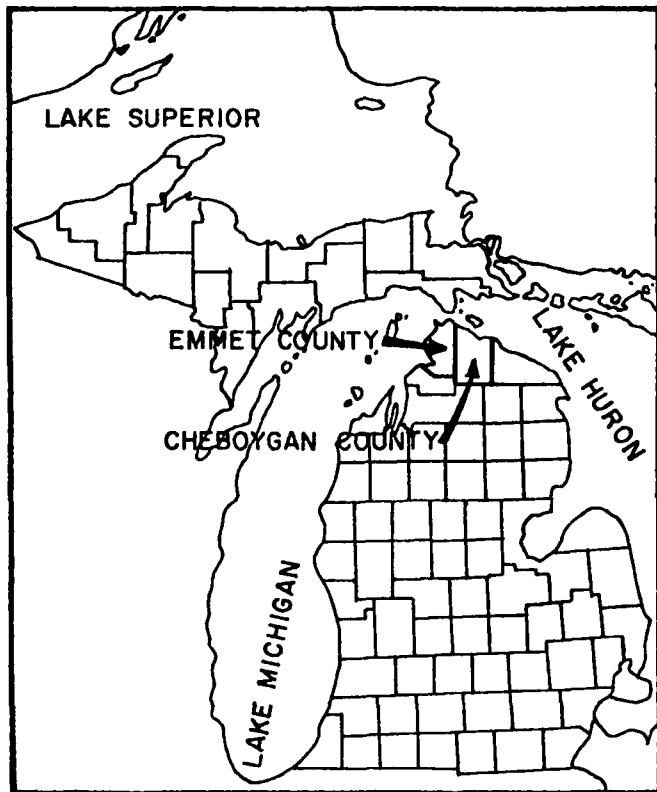
##### Dredging and Disposal

1.11 The proposed site for disposal of dredged material from the Crooked River is located approximately 1 mile inland. As a result, dredging could be performed with a clam-shell dredge and the dredged material would be transported to the disposal site by truck. A transfer facility would be required for loading of the dredged material from the dredging barge into the trucks used for hauling.

Upon verification of the existence of a bald eagle nest by the U.S. Fish and Wildlife Service, dredging of that part of the project in the vicinity of the nest would be suspended between 1 February and 31 July.

1.12 The proposed transfer and disposal sites are located in Emmet County, Michigan (see Figures I-1 and I-2). As shown in Figure I-3, the transfer site is located at the foot of Snider Road on the north side of the Crooked River. The proposed disposal site is located on land which is part of the Hardwood State Forest, approximately 1 mile north of the transfer site on the east side of Snider Road.

FIGURE I - I  
LOCATION OF EMMET & CHEBOYGAN COUNTIES IN MICHIGAN



CORPS OF ENGINEERS

## **LEGEND**

## **WATERFRONT OWNERSHIP**

- SHOWN THIS [ ]  
(O) INDICATES OWNER  
1 MAJESTIC MARINE (O)  
2 HOBART MARINE  
3 MC GREW'S POINT MARINE  
4 ALANSON BOAT WORKS  
5 LOCKE'S MARINA  
6 ENGLE MARINE

## INDEX TO BRIDGES

SHOWN THUS ②

- 1 M-33 HIGHWAY NEW
  - 2 DETROIT & MACKINAC RAILROAD
  - 3 MICHIGAN CENTRAL RAILROAD
  - 4 U.S. 27 HIGHWAY
  - 5 M-68 HIGHWAY
  - 6 ALANSON, VILLAGE OF
  - 7 U.S. 31 HIGHWAY
  - 8 PENNSYLVANIA RAILROAD

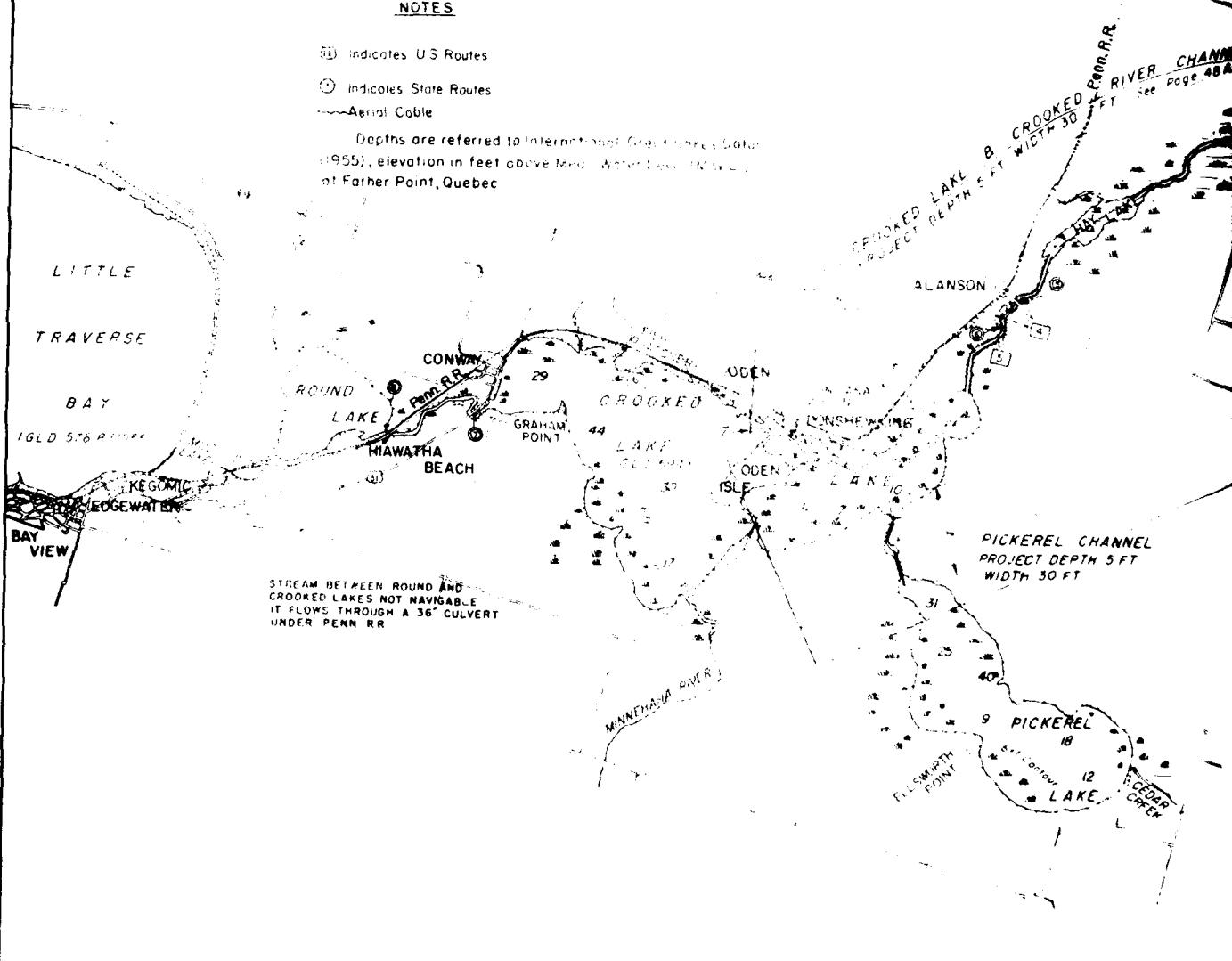
## NOTES

 Indicates U.S. Routes

(\*) Indicates State Routes

-----Aerist Cable

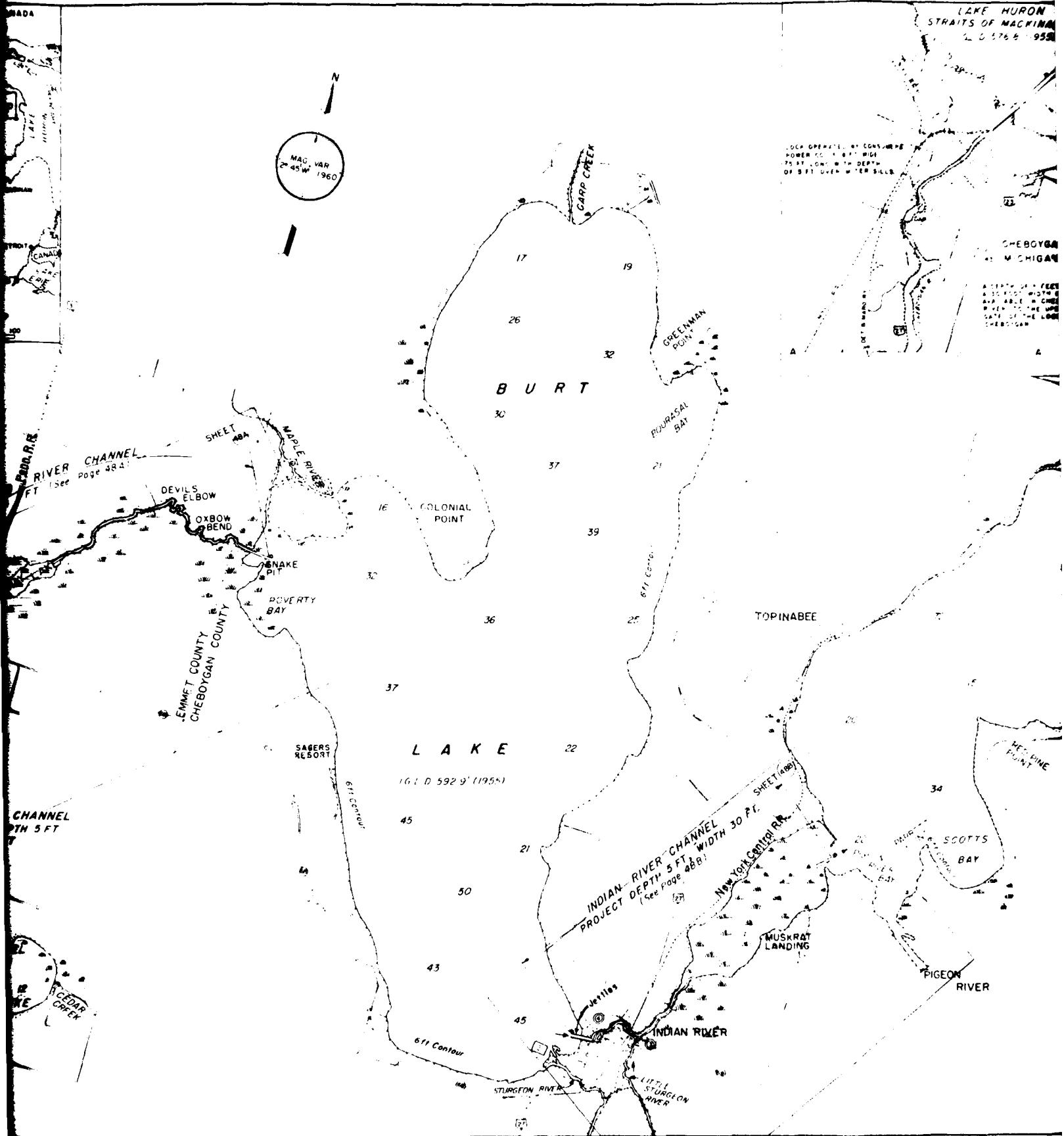
Depths are referred to International Great Lakes Datum (1955), elevation in feet above Mean Water Level (MWL) at Father Point, Quebec.



LAKE MICHIGAN  
STRAITS OF MACKINAW  
L D 576 S 1955

N

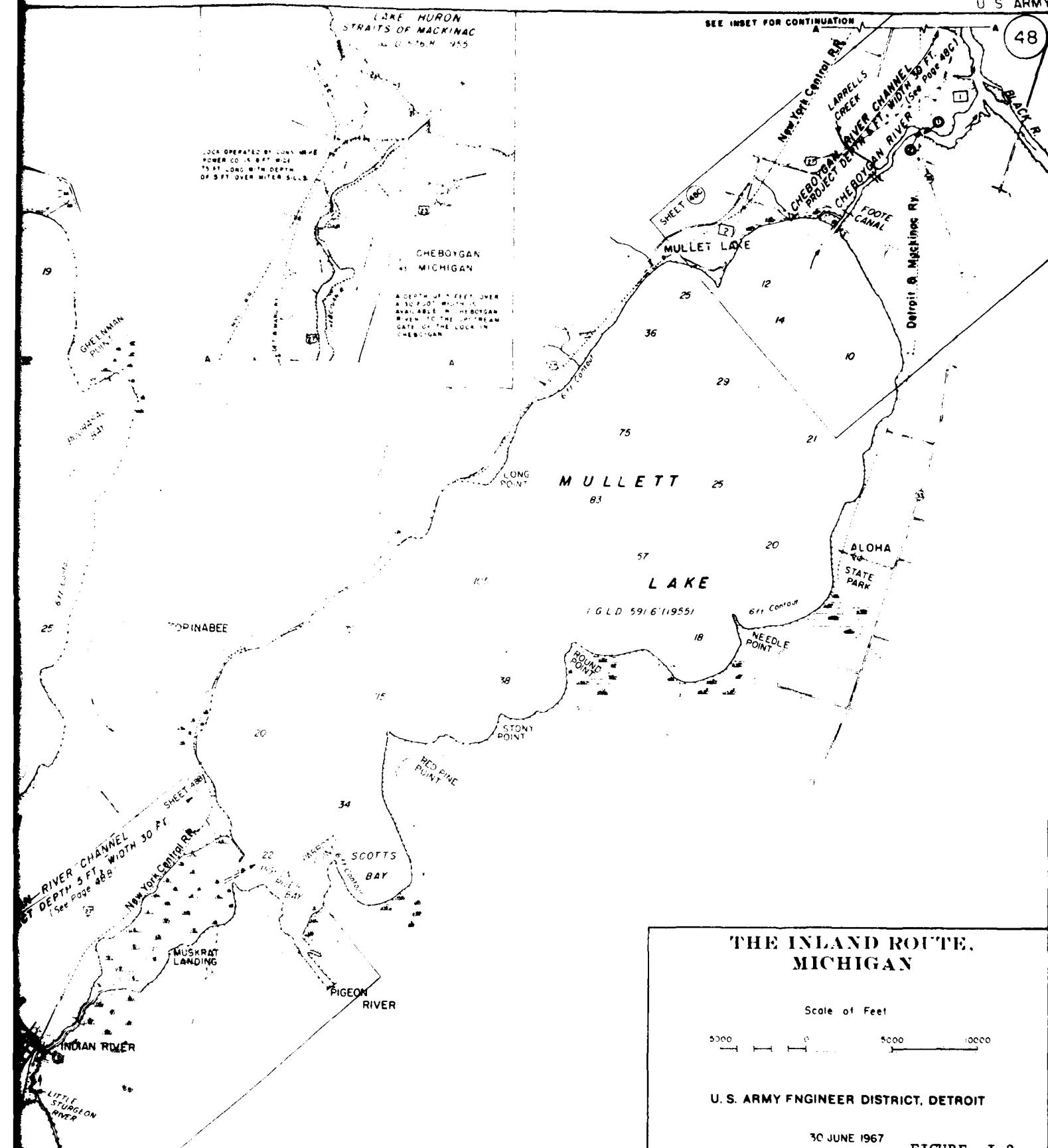
MAC VAR  
2° 45' W  
1960



U.S. ARMY

48

SEE INSET FOR CONTINUATION



I-5

3

FIGURE I-3  
STUDY AREA MAP

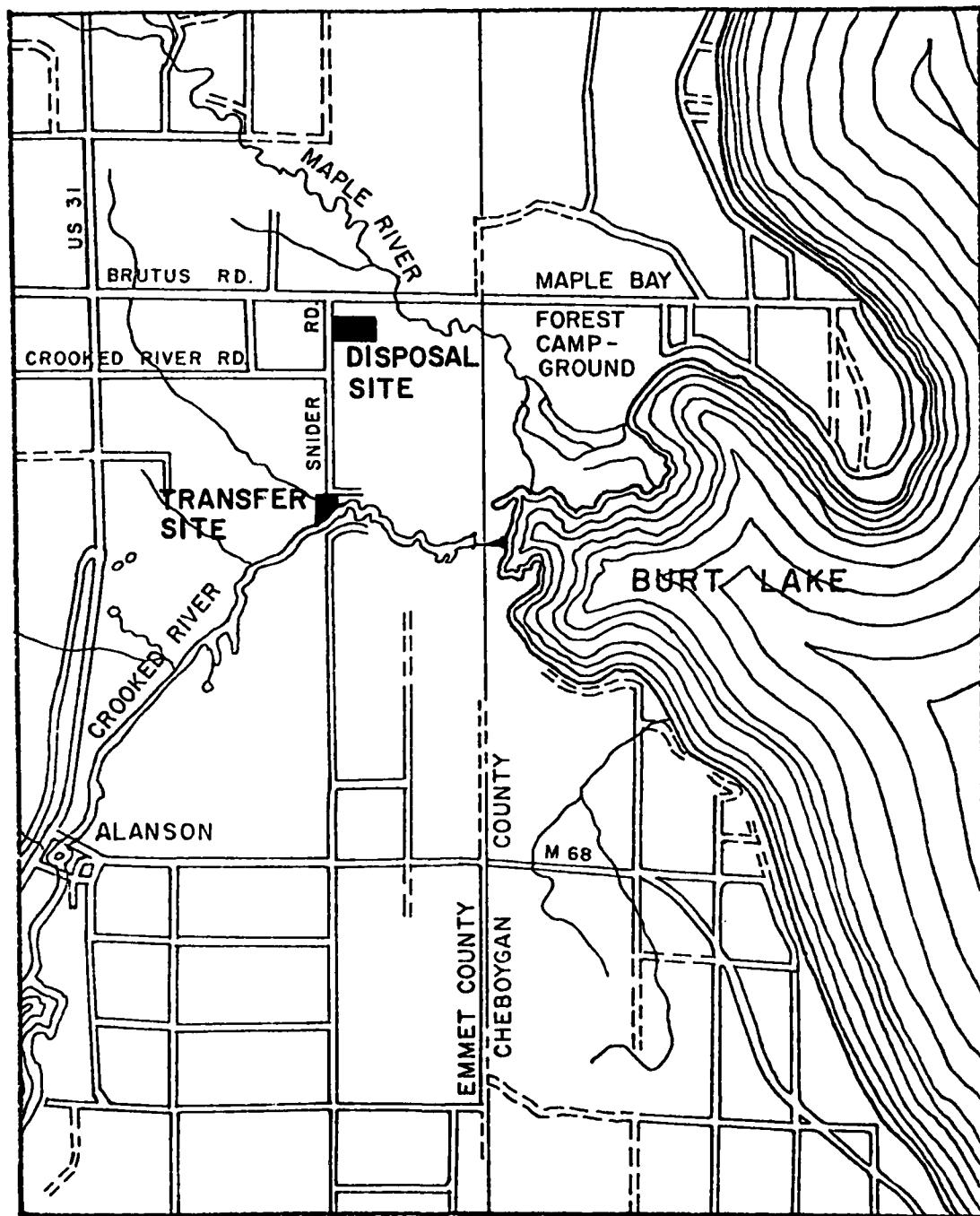
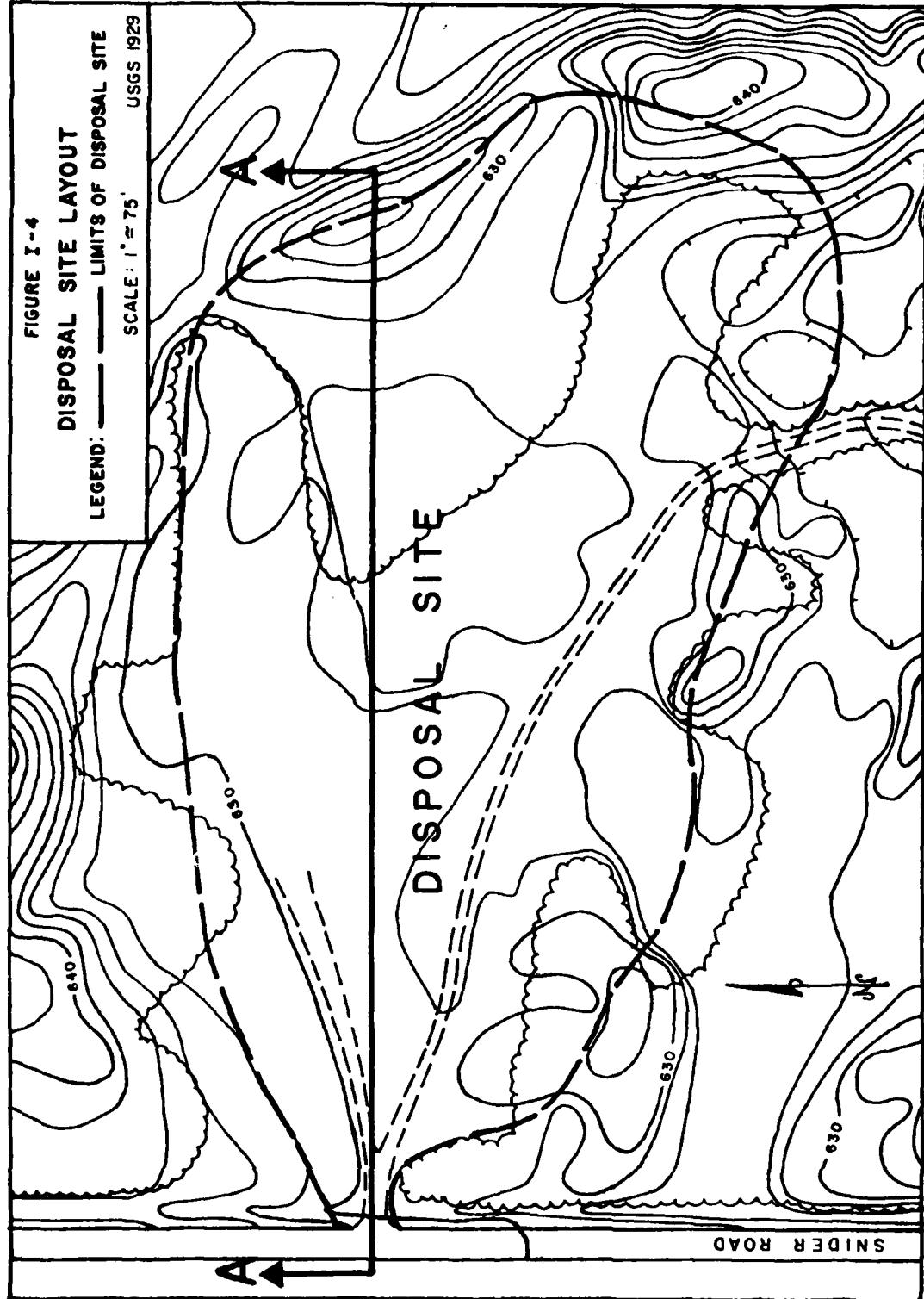


FIGURE I-4  
DISPOSAL SITE LAYOUT  
LEGEND: — LIMITS OF DISPOSAL SITE  
SCALE: 1" = 75'  
USGS 1929



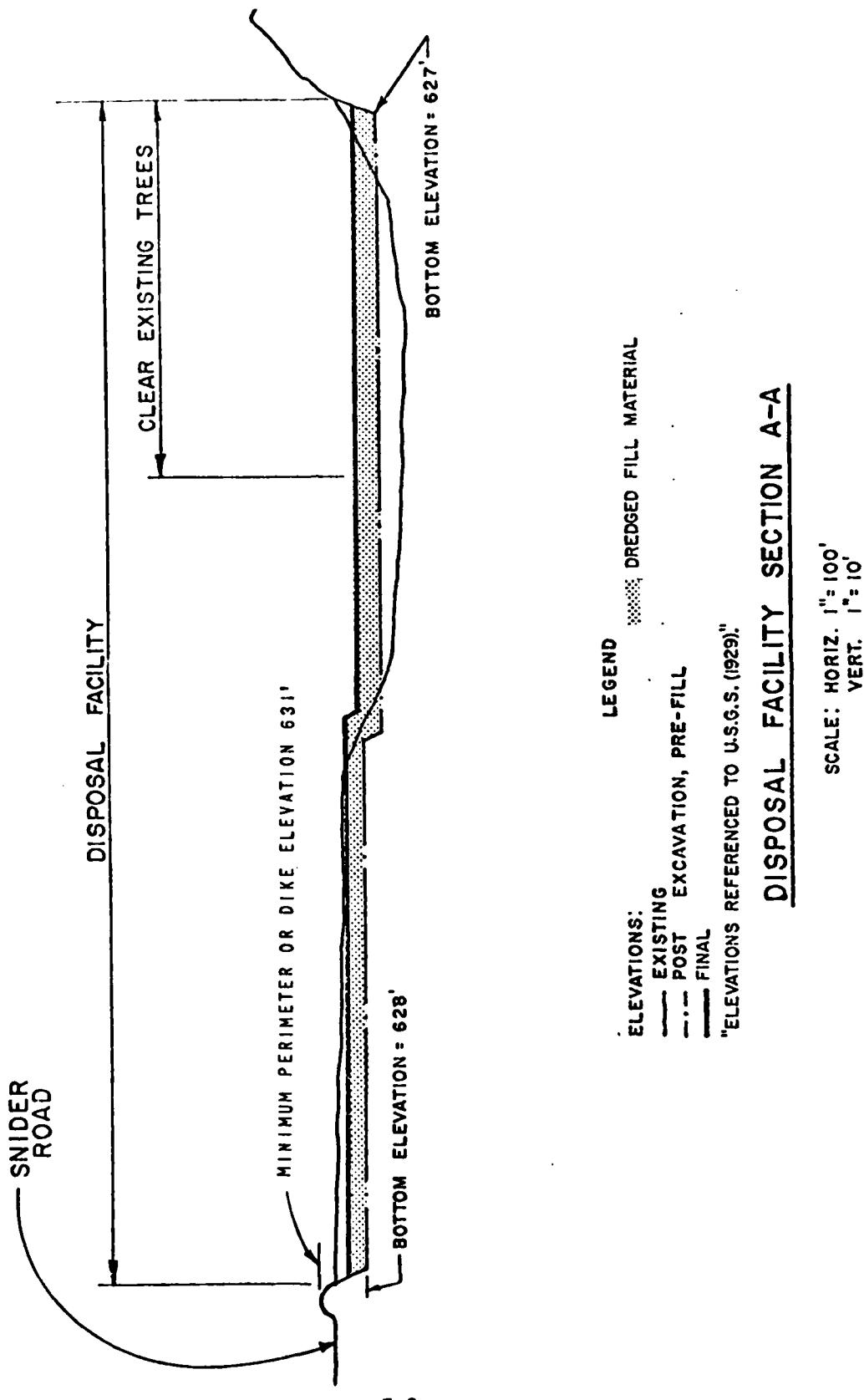


FIGURE I-5

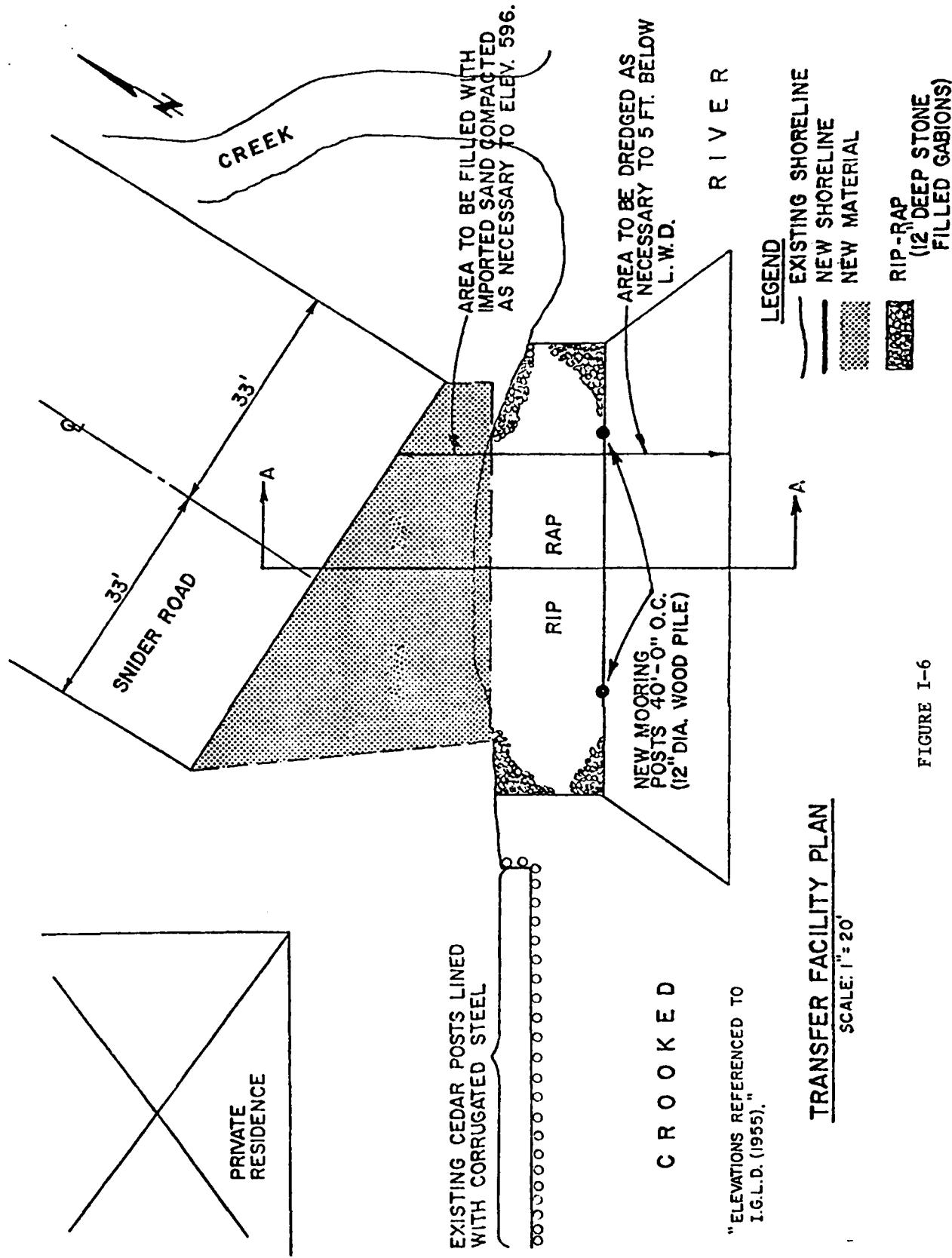
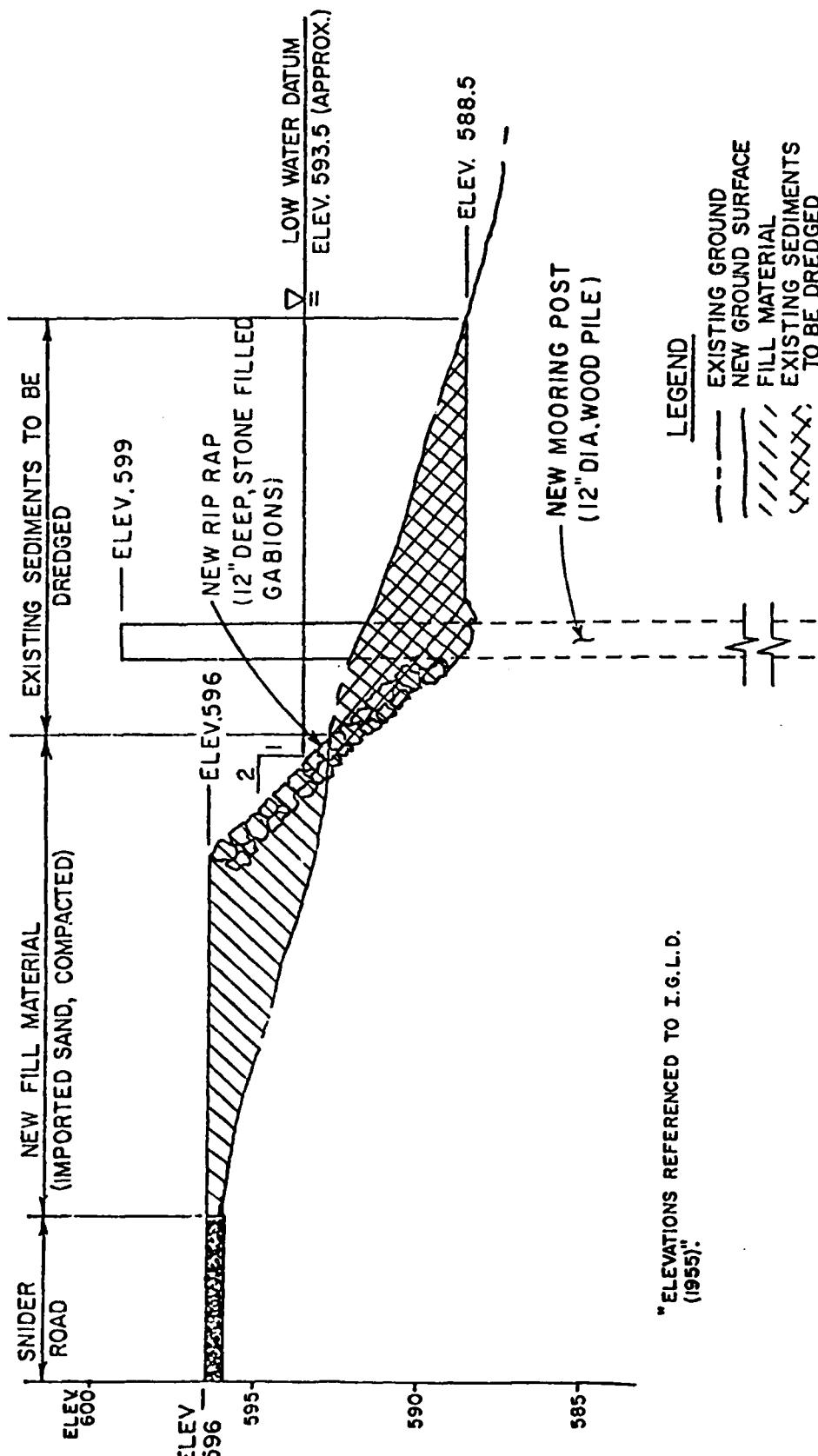


FIGURE I-6



TRANSFER FACILITY SECTION A-A

FIGURE I-7

1.13 The proposed disposal site is illustrated in Figure I-4. As shown, an irregularly shaped area (7.0 acres) has already been cleared at this location. Sandy soil has previously been excavated from the clearing for use on local roadways. Construction on the disposal facility will consist initially of clearing an additional 3.0 acres. This would provide a total of 10.0 acres of cleared land at this location, of which approximately 8.6 acres would be used for the disposal facility. The remaining 1.4 acres would be included in buffer areas along the adjacent private property and Snider Road.

1.14 Existing elevations within the disposal area range from 622 to 632 feet (USGS - 1929). After trees and stumps have been removed, the site would be graded as shown in Figure I-5 before receiving any dredged material. Grading would eliminate depressions and high points in the disposal area to permit relatively uniform application of dredged material, and to form a depressed basin that would contain the dredge material. In addition, grading would result in a site perimeter elevation of at least 631 feet (USGS - 1929) and provide for site runoff control, since dredge material fill elevations would not exceed 629.5 feet.

1.15 The disposal area is designed to contain 19,500 cubic yards of dredged material and any precipitation which falls on the site. There would be no discharge to surface water. Initially, 9,500 cubic yards of backlog dredged material would be applied in an approximately 9 inch thick layer over the entire contained area. The site would then be tilled to mix the dredged material with the native soils and seeded to prevent erosion and to insure its suitability as wildlife habitat. At intervals of approximately five and ten years after construction of the site, 5,000 cubic yards of dredged material from maintenance dredging would be added to the site in  $4\frac{1}{2}$  inch thick layers, and the site would again be tilled and seeded.

1.16 The transfer facility would be located as shown in Figure I-6. The dredging procedure, as proposed, would consist of a bucket dredge mounted on a barge. The barge would be secured to mooring posts at the transfer facility and the dredged material stockpiled on the barge would be off-loaded into dump trucks via a land-based clam shell.

1.17 The transfer facility would be constructed as shown in Figure I-7. Wood piles (12 inch diameter) to be used as mooring posts would be driven 30 feet below the exiting ground surface at a location near the low water datum shoreline. These posts would be approximately 40 feet apart to allow the dredging vessel to be secured fore and aft between the two posts. Dredging would then be performed as necessary to establish a channel 5 feet deep at low water datum between the proposed Crooked River channel and the transfer facility.

1.18 Sandy materials would then be imported to the transfer facility to fill the area between the end of Snider Road and the mooring posts to an elevation of 596 feet (I.G.L.D., 1955). The sand would then be compacted in 6 inch layers beginning 2 feet above the existing water surface. Twelve inch deep stone-filled gabions would be placed over the slope between the edge of the platform and the newly dredged channel to prevent erosion of the fill by river currents.

#### Alanson Lock and Weir Operation and Maintenance

1.19 Navigation Lock and Structures. The existing Federal navigation facilities in the Crooked River require periodic maintenance for continued operation. The lock provides water level regulation of the upstream navigation channel and lakes, flood protection for downstream residents, and vessel passage for recreational boaters during the operational season. Maintenance is performed on a when-needed basis with only "in-kind, in-place" repairs authorized.

#### Public Use Facilities

1.20 Proposed activities include construction of a parking lot, restroom facilities, storage building, observation platform, and docking area. After construction the area would be restored in a manner consistent with the natural character of the area.

1.21 At the present time there exists no parking facilities for the visitors, boaters, and fisherman who come to the site. This results in congestion from parked cars along the shoulder of the narrow, earthen, access road. The proposed asphalt parking lot would be constructed on an area just west of the lock and would accommodate 25 cars, thereby reducing the congestion.

1.22 The brick storage building is planned for the northeast corner of the site, adjacent to the existing service area. It would be large enough to contain a truck, snow removal equipment, and other material relating to the lock's maintenance. An existing fence would be moved to inclose the building and heated rest-room facilities.

1.23 View of the lock's operation is poor from the bank. To overcome this, a walkway is proposed from the shore, over the lock and weir, and down the opposite bank, where a wood-chip trail would be provided. Five to ten wood piles would be driven into the river bottom to provide support for the walkway. This walkway would provide easy access to the trail along the east bank. It is anticipated that a trail along the west bank of the river would likely interfere with efficient lock operation.

1.24 A 20 foot pier is proposed to be located north of the existing service area. This pier would handle Corps' and MDNR's work boats, and would not be used by the public. An entrance gate would be required in the existing fence to provide access.

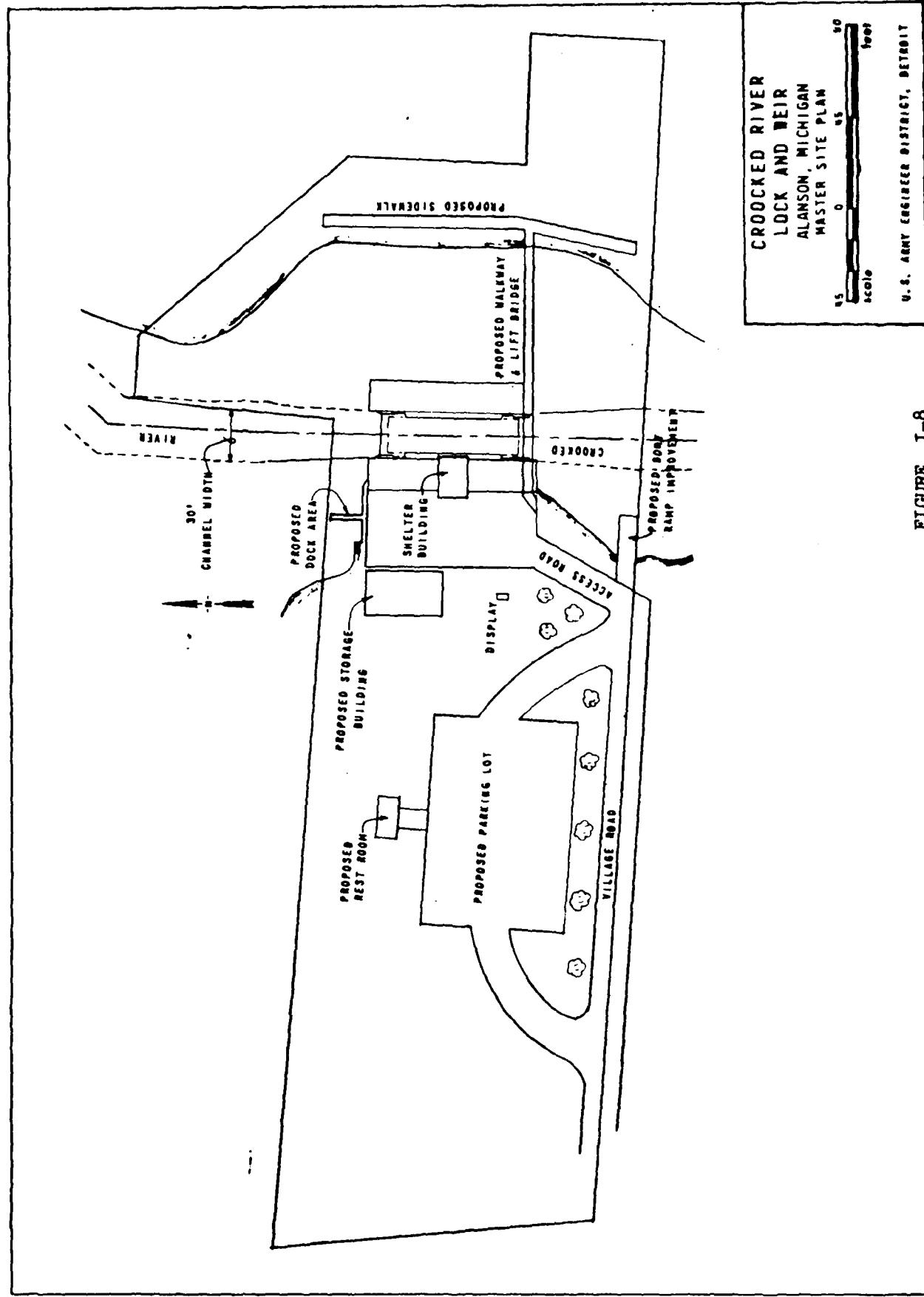
1.25 Plants indigenous to the area, such as maple, elm, cedar and birch, would be used for replacing those trees removed during construction. A small display near the lock explaining its operation would be included in the plan, where descriptive handouts would be provided. An existing, earthen boat ramp could be developed into a more permanent structure in the future.

#### D. Dredged Material Characteristics

1.26 Analysis of five sediment samples collected by EPA Region V (see Appendix A) indicate high organic concentrations, moderate to heavy lead and barium concentrations and low to moderate nickel and copper concentrations in the Crooked River channel between Crooked Lake and Burt Lake. The replicate sample collected for sampling station Number 2 indicates the high degree of variability in the sediment quality which may occur in this area.

1.27 The elutriate test results indicate some release of COD, TOC, TKN and ammonia. The elutriate data indicates a similarity between the two replicate samples even though the bulk sediment analysis data shows INR75-2 replicate different than INR75-2. Sieve analysis conducted on the samples indicate that both samples have similar silt and clay size fractions. This fine fractions would be expected to have the greatest potential for dissolution and this may be the reason for the comparable elutriate results.

1.28 Counts of the macroinvertebrate population in three sediment samples indicate a very high species diversity. The taxa cover the entire range of intolerant to tolerant species. No toxicity problems are indicated.



## II. ENVIRONMENTAL SETTING WITHOUT THE PROJECT

### A. Area Description

2.01 The Inland Route consists of a series of approximately 36 miles of interconnecting lakes and rivers across the northern tip of the Lower Peninsula of Michigan, from Conway near Lake Michigan to Cheboygan on Lake Huron. The Inland Route includes four inland lakes (Mullett, Burt, Crooked, and Pickerel) and four connecting waterways (the Cheboygan, Indian, and Crooked Rivers and Pickerel Channel). The Route's only outlet to the Great Lakes is at Cheboygan. Major tributaries to the Inland Route include the Minnehaha, Maple, and Black Rivers. The total drainage area of the Inland Route is 865 square miles.

2.02 There are two locks on the Inland Route, one located near Alanson, Michigan, which is operated for the Corps of Engineers by the Michigan Department of Natural Resources (DNR), and one located in Cheboygan, which is owned and operated by the State of Michigan. The lock and weir at Alanson is situated about 1,250 feet downstream of the northeasterly end of Crooked Lake on the Crooked River and about 2,100 feet upstream from the swing bridge in Alanson. The lock operated by the State of Michigan on the Cheboygan River is located in the City of Cheboygan.

2.03 The Inland Route project was originally constructed for use by recreational craft. As a measure of the usage which the Crooked River receives, historical records of traffic through the lock at Alanson are shown on Table II-1.

2.04 The proposed dredged material transfer and disposal sites are both located on Snider Road approximately 3 miles northeast of Alanson in southeastern Emmet County. The disposal site is located on state land in the Hardwood State Forest in Section 25 of Maple River Township. The transfer facility is located at the foot of Snider Road in north Maple River Township. The transfer and disposal site locations are shown in Figure I-3.

### B. Climate

2.05 Climatic data for the area is available from the Michigan Weather Service Station at Pellston, Michigan, located approximately 7 miles north of the proposed disposal site. The terrain of northern lower Michigan is relatively flat and lies 600 to 800 feet above sea level. As a result, very little climatical influence is related to terrain in this area.

2.06 Climate in the area is significantly influenced much of the year by its proximity to Lake Michigan. Prevailing westerly winds bring cool spring and early summer temperatures. Fall and early winter temperatures are milder than what would normally be expected due to increased cloudiness. Similarly, heavy fog occurrences reach a maximum in August, September, and October as a result of the passage of relatively cold air masses over the warmer waters of the Great Lakes.

TABLE II-1  
TRAFFIC THROUGH THE CROOKED RIVER LOCK AT ALANSON, MI - 1969 to 1976

Month	1968 Vessels	1969 Vessels	1970 Vessels	1971 Vessels	1972 Vessels	1973 Vessels	1974 Vessels	1975 Vessels	1976 Vessels
April	135	20	48	53	74	84	95	19	110
May	554	724	593	534	841	485	560	632	568
June	1,864	1,280	1,497	1,283	1,553	1,375	1,562	1,639	1,608
July	3,733	4,222	3,528	3,275	3,676	3,274	2,928	3,297	3,514
August	3,868	4,532	3,547	3,211	2,740	3,150	3,385	2,975	3,181
September	1,220	1,071	1,124	1,130	1,380	1,315	781	726	1,071
October	506	405	605	852	421	573	380	506	486
November	58	73	93	63	114	11	58	51	
Total	11,938	12,327	11,035	10,401	10,799	10,267	9,749	9,845	10,538

II-2

Source: U.S. Army Corps of Engineers, Detroit District.

Under conditions of easterly winds and clearing skies, the area's location near the center of a bowl shaped basin produces some colder than normal temperatures. Thus, the area's climate varies from continental to quasimarine in character with the changing of weather patterns.

2.07 Changing weather patterns are common because of the high frequency of migratory low pressure systems moving toward the east and the northeast through the northern Great Lakes. As a result the area seldom experiences long periods of either hot humid weather during the summer or extreme cold during the winter.

2.08 Temperature data for Pellston show the following extremes: a high of 103° F. on 6 August 1947 and a low of 37° F. below zero on 23 January 1948 and 28 February 1959. Summers are dominated with moderately warm temperatures, with an average of five days exceeding 90° F. On the average, 93 percent of minimum temperatures from November through March are 32° F. or below. (1)

2.09 Precipitation is well distributed throughout the year with the summer season (May through October) receiving an average of 17.58 inches, or 56 percent of the average annual total. September with 3.81 inches is the wettest month, while February, with 1.50 inches on the average, is the driest month. Evaporation for the class "A" pan during the summer season, based on data from Lake City, is estimated to average 28.0 inches for the Pellston area. With the average potential moisture evaporation during the summer season exceeding the average precipitation by 59 percent, soil moisture replenishment during fall and winter months plays an important role in the success of the limited agriculture and the growth of forest in this area.

2.10 The average annual snow fall for Pellston is 98.2 inches. Pellston averages 126 days per season with 1 inch or more snow on the ground, but this will vary substantially from year to year. The average date for the last freezing temperature in the spring is June 6, while the average date of the first freezing temperature in the fall is September 1. Thus, the freeze free period, or growing season, averages 86 days a year. (1)

Additional climatic data is provided in Table II-2.

### C. Geology and Topography

2.11 The northern Lower Peninsula of Michigan is underlain by sedimentary rocks formed during the Paleozoic era. In Emmet and Cheboygan counties the most recent bedrock dates from the Devonian period. Older Precambrian metamorphic and igneous rocks are found below some of the Paleozoic formations, while unconsolidated surface materials above the bedrock consists primarily of deposits of glacial outwash and till, with lesser amounts of lake and river bottom clay. (2,3) A schematic geologic cross-section of the Michigan Basin is shown in Figure II-1. (4)

TABLE II-2

CLIMATOLOGICAL SUMMARY FOR  
PELLSTON (EMMET COUNTY), MICHIGAN

Latitude            45° 34'  
 Longitude          84° 48'  
 Elev. (Ground)    710 Feet

Means and Extremes for Period 1942-1969

Month	Temperature (°F)			Precipitation Totals (Inches)		
	Daily maximum	Daily minimum	Monthly	Mean	Greatest daily	Year
(a)	28	28	28	28	28	
January	25.6	7.6	16.6	2.08	.92	1950
February	26.9	5.2	16.1	1.50	2.09	1960
March	35.8	13.9	24.9	2.01	1.50	1965
April	50.8	28.4	39.6	2.57	1.49	1944
May	63.4	37.4	50.4	2.90	1.36	1943
June	74.0	47.4	60.7	3.15	2.92	1963
July	78.5	51.7	65.1	2.49	1.59	1951
August	76.8	51.0	63.9	2.82	4.17	1968
September	67.7	44.0	55.9	3.81	2.78	1961
October	57.7	35.9	46.8	2.41	1.73	1954
November	41.6	26.9	34.3	3.19	1.57	1966
December	29.9	14.8	22.4	2.33	1.28	1942
Year	52.4	30.4	41.4	31.26	4.17	Aug. 1968

(a) Average length of record, years.

Source: U.S. Department of Commerce NOAA, Environmental  
Data Service, Asheville, NC

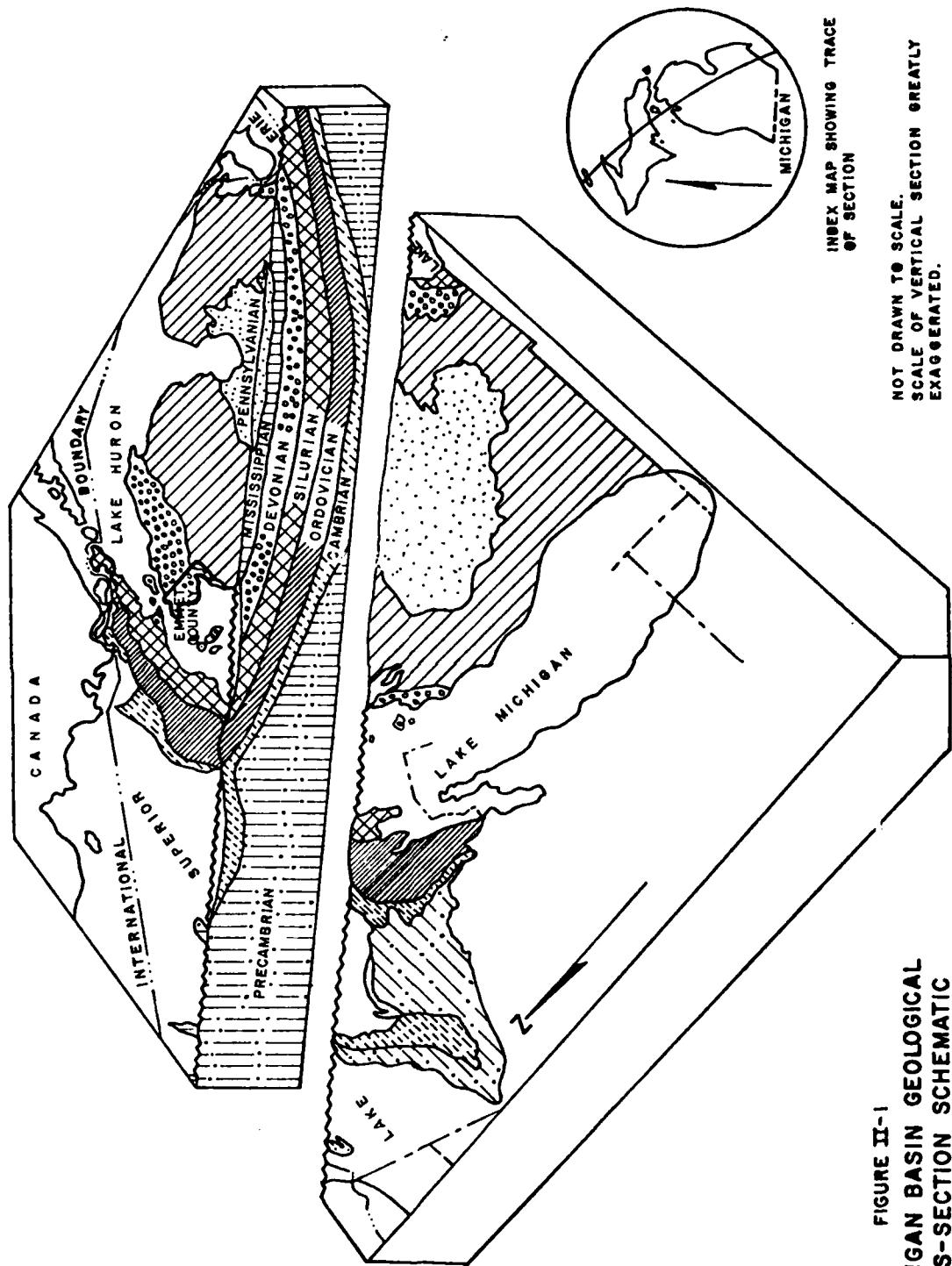


FIGURE II-1  
MICHIGAN BASIN GEOLOGICAL  
CROSS-SECTION SCHEMATIC

2.12 All of the Inland Route area was glaciated four times during the Pleistocene epic. The most recent, or Wisconsin, glaciation was the most important in this area. With the retreat of the last glacier, the area was left with a series of moraine ridges and a large lake, known as Lake Algonquin, which covered all of the present inland lakes in this area and large areas of the adjacent lowland as well. When the level of Lake Algonquin receded, Douglas and Black Lakes became isolated from the Inland Route, which was still submerged. (5)

2.13 During Nipissing time, the Inland Route outlet to Lake Michigan in Little Traverse Bay was partially closed by sand bars, which were subsequently heaped into dunes over 100 feet tall by the prevailing westerly winds. With the recession of Lake Nipissing to the present Great Lakes level, a smaller inland lake was formed which occupied all of the Inland Route area from the bar at the head of Little Traverse Bay to Cheboygan. Subsequently, this lake was divided by a bar in Indian River and then lowered to the present conditions as the Cheboygan River deepened its channel. The recession of historic lake levels in Emmet County following the Wisconsin glaciation is shown in Figure II-2.

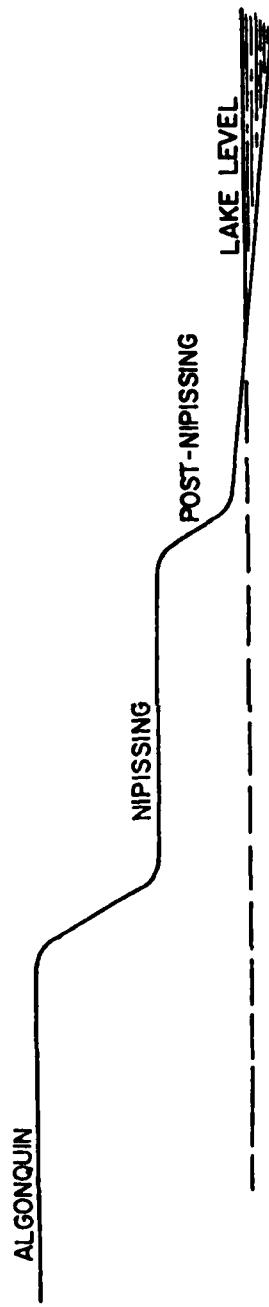
2.14 The Crooked River, between Crooked and Burt Lakes is a relatively slow moving stream with a drop of approximately one foot in the slightly over 4 miles of its length. The river valley runs between the edges of the Nipissing terrace as it leaves Crooked Lake and then runs in a relatively straight Channel until it begins to meander at Devils Elbow. This appears to be the highest place in the river, with the banks corresponding in elevation to the indications of the Post-Nipissing level on Crooked Lake. Thus, it is evident that the drop to the present lake levels is a result of the Crooked River having cut a deeper channel through the sands in the area of Devils Elbow. (5)

2.15 As the result of the Wisconsin glaciation and subsequent formation of Lakes Algonquin and Nipissing, the topography of northern Lower Michigan is dominated by glacial morainic ridges and ancient lake beds. This is true for the immediate vicinity of the proposed project as well as for the region as a whole. Both the proposed transfer and disposal sites are located in ancient lake beds. Glacial moraines are also an important topographic feature in the area, as evidenced particularly by the moraine which forms Colonial Point approximately 1/2 miles to the east-northeast of the proposed disposal site.

#### D. Soils

2.16 The soils in Emmet County are composed of approximately 40 different series. The Blue Lake - Leelanau association is the most common soil association, covering approximately 34 percent of the county. Similarly, it is the most extensive association in Maple River Township. Blue Lake soils makeup about 65 percent of this association consists of well drained and poorly drained minor soils.

FIGURE II -2  
DIAGRAMATIC PROFILE OF POST-WISCONSIN LAKE LEVELS IN EMMET COUNTY



Blue Lake and Leelanau soils are well drained and formed in loamy sand and sand. Both soils have several thin layers of loamy sand and sandy loam at a depth of 24 to 60 inches. Many of the adjacent drainage ways are occupied by poorly drained or very poorly drained Ensley soils. (6)

2.17 The soils are normally easily erodible in areas where vegetation is sparse, since they are subject to both wind and water erosion. The soils in this association tend to be medium to low in natural fertility. Wooded areas on this association tend to be covered with northern hardwoods, while cleared areas are used for pasture or hay, or are idle.

2.18 Soils on the dredged material disposal site and surrounding areas are mapped by the Soil Conservation Service as the Blue Lake series, which consists of nearly level to fairly steep, well drained soils. In general the soils have a moderate available water capacity, and permeability is moderately rapid. Thus, surface runoff is generally slow.

2.19 The boring log for the subsurface soil investigations conducted at the disposal site on 22 June 1977 is shown in Appendix C. As the boring log indicates, subsoils are a silty sand to at least a depth of 30 feet. This is consistent with boring logs for water wells which have been installed within a radius of a few miles of the site. (7) Water well logs generally indicate that the top 25 to 35 feet of soil is sand. Underlying soils to a depth of approximately 150 to 200 feet are predominantly clay with occasional minor strata of sand or hardpan. Beneath the clay is a sand and/or gravel water-bearing stratum. This is the principal source of potable water supply for residents of the area.

2.20 The predominantly sandy character of the surface soils at the disposal site is demonstrated by previous surface excavation for use of the sand for road construction. As a result of this excavation, approximately the top two to three feet of the surface soils have been removed from the proposed disposal site.

2.21 Soils at the transfer site are mapped as the Tawas series. This soils series consist of very poorly drained, organic soils, 12 to 42 inches thick overlying sand, or loamy sand. Tawas soils generally occur in depressions or large natural drainage ways on lake plains, outwash plains, or moraines. In a representative profile, the surface layer is very dark grey organic silt about 6 inches thick. Below this is very dark brown organic silt about 15 inches thick. The substratum is grayish-brown sand. (6)

2.22 The boring log resulting from subsurface soil investigations at the proposed transfer site is shown in Appendix C. As with typical Tawas soils, highly organic surficial soils and subsoils are underlain by a stratum of sand. Below this is silty clay and a sandy silt, and below this is a marl deposit to the bottom of the test boring. Well logs from water wells installed in the area (see

Figure II-3 for location and depth) indicate that the marl deposit generally reaches a depth of approximately 120 feet. This is normally underlain by approximately 10 to 20 feet of hardpan or clay, and below this is a water-bearing sand and gravel stratum.

#### E. Hydrology

##### Surface Water

2.23 Maple River, Crooked River and Burt Lake are the principal surface water features in the vicinity of the study area. Although relatively sluggish, both Crooked and Maple Rivers are continuous streams which flow into Bullhead and Maple Bays, respectively, in Burt Lake. The Crooked River is part of the Inland Route, and the Corps of Engineers is authorized to maintain a navigation channel through it. The Maple River is not used for navigation since it drains through several small channels in a delta at its mouth. As a result of the delta, there are several hundred acres of marsh and swamp lands around Maple Bay and Bullhead Bay, approximately one mile east of the study area.

2.24 There are no surface waters within 2,000 feet of the proposed disposal site. Similarly, there are no well defined drainage ways in the vicinity of the site, except a drainage ditch along Snider Road. Soils in the area are extremely porous and the topography is relatively flat, with most of the site having a slope of 1 percent or less. Thus, surface drainage from the proposed project area is minimal.

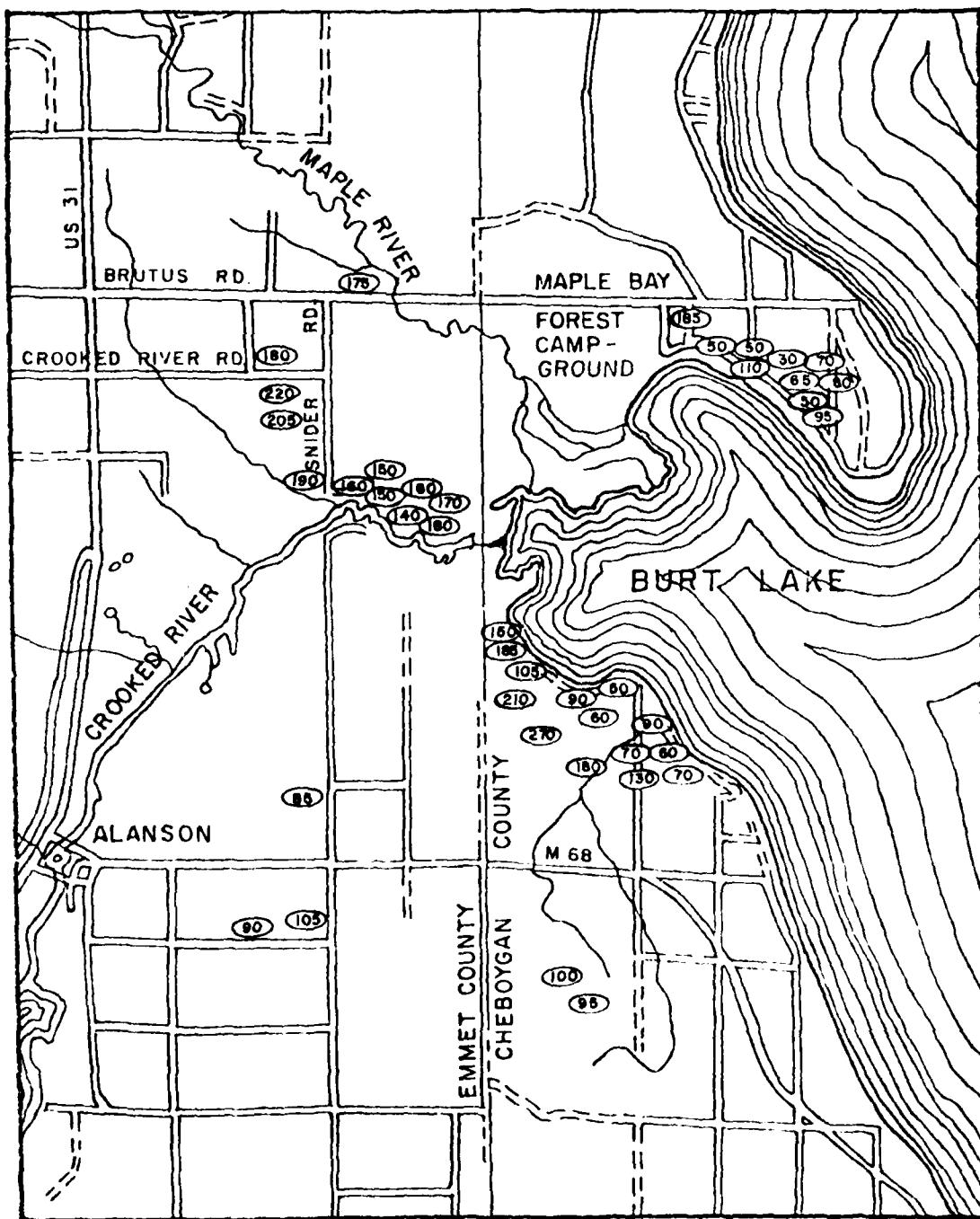
##### Groundwater

2.25 Groundwater aquifers in the glacial sand and gravel of the Inland Route area provide the only significant source of domestic potable water supply. Figure II-3 shows the location and depth of water wells in the vicinity of the study area. As shown, nearly all of the wells in the area utilize an artesian groundwater aquifer which is found between 150 and 220 feet below the surface, depending on well location. Water well records maintained by the Michigan Department of Public Health indicate that wells in the study area generally produce in excess of 60 gpm. Unsustained yields in the range of 100 to 500 gpm from 6 inch wells have also been reported. (2) Permeability of the aquifers is sufficiently great that minimal drawdown is observed at a 60 gpm pumping rate.

#### F. Vegetation

2.26 Emmet County was originally covered almost entirely by forest. Northern hardwoods and pines grew on both uplands and bottom lands. Between 1860 and 1900 most of the pines and subsequently the hardwoods were cut for lumber. Currently, approximately 62 percent of the county is woodland, 37 percent of which is publicly owned.

FIGURE II-3  
LOCATION AND DEPTH OF GROUNDWATER WELLS IN THE PROJECT AREA



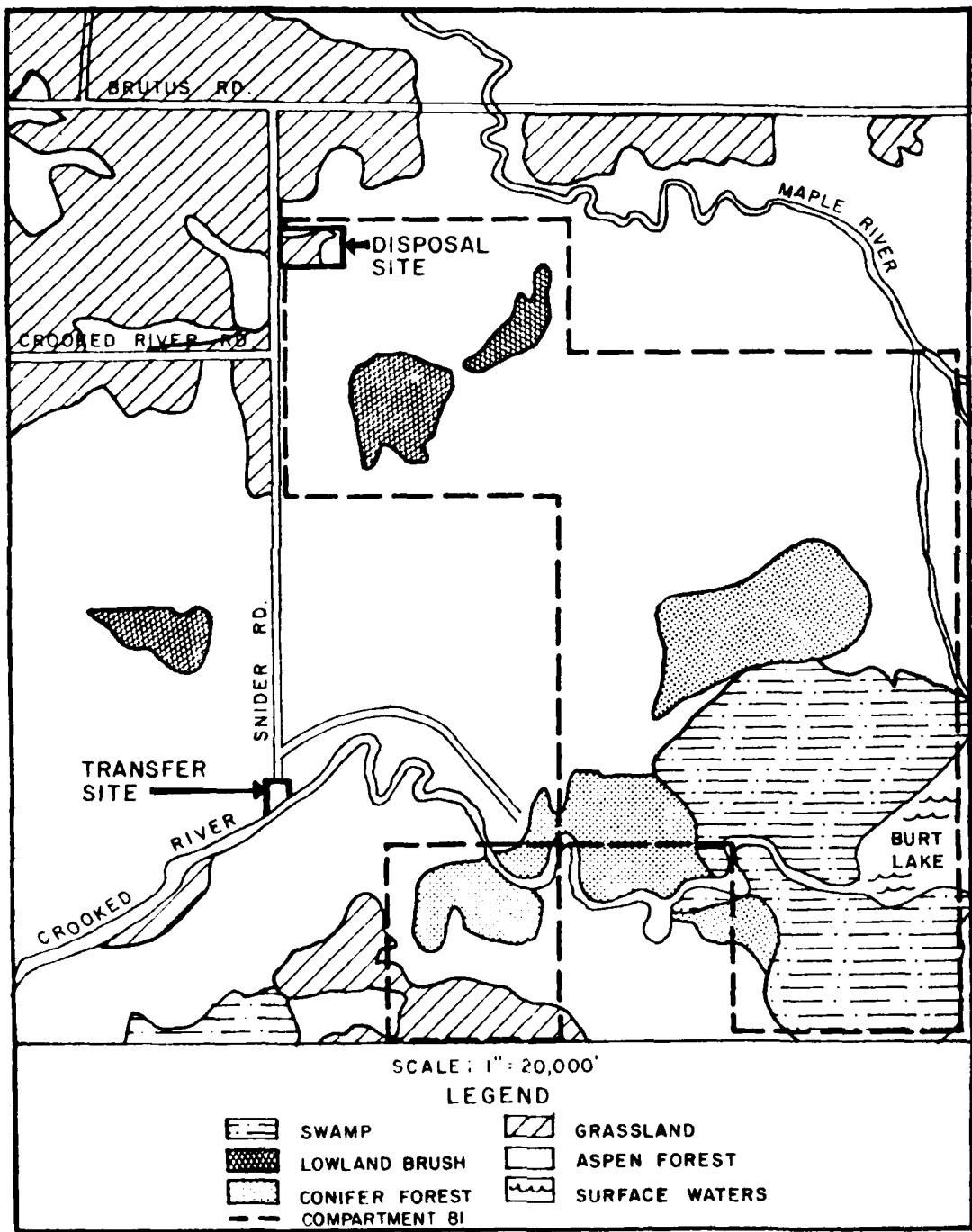
2.27 There are six general forest types in the county; northern hardwoods, aspen and paper birch, pine, conifer swamp, lowland hardwoods, and oak. Pine is the least extensive type and normally occurs in tracts throughout the other forest types. The composition of the principal forest types is as follows: (6)

- . Northern hardwoods: chiefly sugar maple and varying quantities of beech, elm, and basswood. Some red oak, white ash, and scattered yellow birch also occur.
- . Aspen and paper birch: mostly quaking aspen and bigtooth aspen, with lesser quantities of paper birch.
- . Pine: jack, red or white pine in pure or mixed stands, and scotch pine plantations for Christmas trees.
- . Conifer swamp: predominantly northern white-cedar, balsam fir, hemlock, black spruce, white spruce, and tamarack. There are also mixtures of aspen, paper birch, elm, willow, red maple, and various shrubs. Occasionally there are pure stands of black spruce, northern white cedar or tamarack.
- . Lowland hardwoods: chiefly elm, ash, and red maple. There are various mixtures of aspen, cotton wood, white spruce and various shrubs.
- . Oak: chiefly northern red oak, black oak and white oak.

2.28 The distribution of vegetative cover in the vicinity of the proposed disposal site is shown in Figure II-4. The area enclosed by a dashed line in Figure II-4 represents the majority of "Compartment 81" of the Hardwood State Forest. Coverage of this tract is as follows: (8)

<u>Vegetation</u>	<u>Percent Coverage</u>
Aspen	49.6
Lowland hardwoods	2.6
Northern hardwoods	5.4
Red Pines	0.4
White Pines	16.7
Swamp conifers	1.5
Cedar	10.6
Lowland brush	2.5
Grass	2.5
Water	1.5
Marsh	6.5
Undetermined	0.2

FIGURE II-4  
VEGETATION IN THE PROJECT AREA



2.29 Areas immediately adjacent to the disposal site are classed as high density (more than 700 trees per acre) restocking (average diameter at breast height (AV DBH) less than 5 inches) Aspen with greater than 70 percent crown cover. Adjacent privately owned land is similar, or cleared and used for pasture. The majority of the proposed disposal area is classed as upland grass, described as a potentially productive open upland area with less than 10 percent stocking of tree species or shrubs and having cover of either grasses, ferns or berries. (9)

2.30 Existing disposal site vegetation (July 1977) is shown in Figure II-5. As shown, it is consistent with the designation of this area as upland grass. The approximate distribution of vegetation on the site is as follows:

Type of Vegetation	Percent
No cover	18
Ferns	12
Grasses	30
Wildberries	10
Aspen	30

#### G. Wildlife

2.31 White-tailed deer, ruffed grouse, woodcock, snow shoe hare, grey squirrel, black bear, red fox, bobcat, coyote and raccoon are all important game animals in Emmet County. In addition, ducks and geese utilize the county during fall and spring migration, as well as for nesting. White-tailed deer are the only wildlife species in Emmet County for which the population has been determined. A 1972 spring survey indicated an "over winter" population of eight deer per square mile, (3,680 deer total) in Emmet County. The 1973, 1974, and 1975 surveys indicated populations of ten (4,610), eight (3,680), and thirteen (5,990), respectively. The buck hunting kill for the period of 1956 to 1970 was approximately 500 animals annually, or one per square mile on the average. (9)

2.32 The other principal game animals listed in the preceding paragraph have not been extensively studied and their ranges and populations in Emmet County are largely unknown. Ruffed grouse and American woodcock require open grassy areas for feeding, and some might frequent the disposal site. Snowshoe hare are normally found in areas of conifer cover and squirrels in areas of oak forest. Thus, the disposal area is not suitable habitat for these species. Black bears are uncommon throughout the county. Red fox, coyote, bobcat, and raccoon are scattered throughout the county. Bobcats are confined to a few large swamps and distribution of these other species has not been determined.

FIGURE II-5 DISPOSAL SITE VEGETATION

VEGETATION LEGEND

NONE

GRASSES

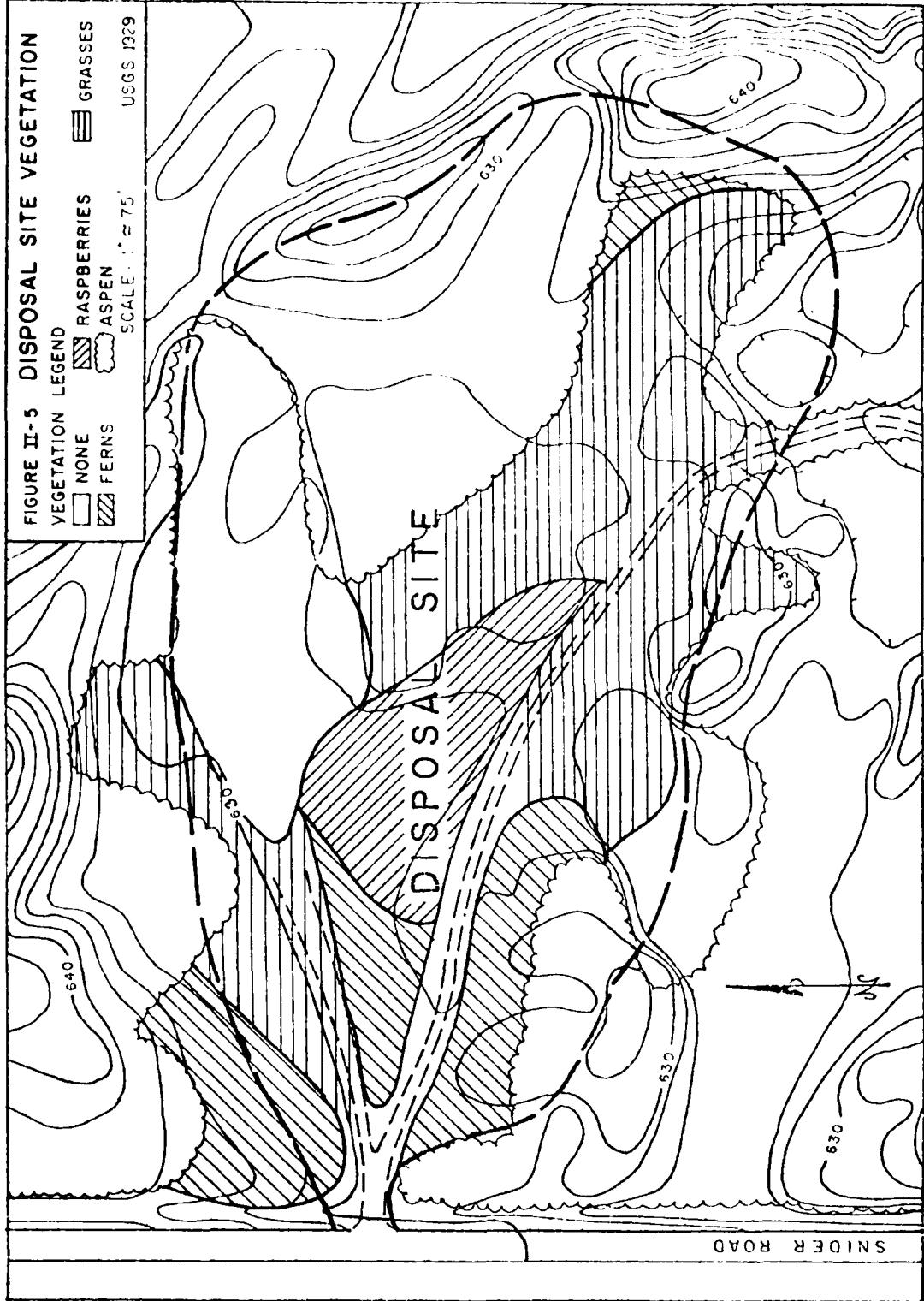
RASPBERRIES

ASPEN

FERNS

SOURCE:  $\approx 75'$

USGS 1929



2.33 Site observations indicate that the disposal site is utilized by deer as a yarding area. In addition, common song birds feed on the wild raspberries on the site. Utilization of the site by other types of wildlife is not evident.

#### H. Fisheries Resources

2.34 The variety of stream and lake habitats in the drainage basin provides a diversified fishery. The cold water feeder streams harbor self-sustaining brook (Salvelinus fontinalis), brown (Salmo trutta), and rainbow (Salmo gairdneri) trout populations while the rivers and lakes contain northern pike (Esox lucius), walleye (Stizostedion vitreum), large and small mouth bass (Micropterus spp.), muskallunge (Esox masquinongy), gar (Lepisosteus sp.), sucker (Catostomidae), carp (Cyprinus Carpio), and bowfin (Amia calva). Winter ice fishing is a popular sport in the area and, during February, lake sturgeon (Acipenser fulvescens) spearing through the ice is legal sport. In 1973, the Michigan record sturgeon (190 lbs.) was taken from Mullet Lake.

2.35 Actual fish spawning in the area has not been identified, although upstream migrations of walleye, bass, pike, suckers, and sturgeon are known to occur in the drainage basin.

#### I. Threatened and Endangered Species

2.36 The bald eagle (Haliaeetus leucocephalus), the eastern timber wolf (Canis lupus lycaon), the Indiana bat (Myotis sodalis) and the Kirkland's Warbler (Dendroica kirtlandii) are species on the U.S. List of Endangered and Threatened Wildlife and Plants (14 July 1977 Federal Register) that have ranges in Michigan. (10) The peregrine falcon is considered an occasional migrant. The only known timber wolves in Michigan are located on Isle Royale.

2.37 The only known nesting areas in the world for the Kirtland's Warbler are in several counties in North-central Lower Michigan. Typically the habitat most attractive to the nesting warblers is a stand of jack pines with special characteristics. A tract must be at least 80 acres in size, preferably larger, and there must be a considerable amount of open area interspersed with homogeneous thickets of small pine from six to twenty feet in height or 20 years of age. Stands of grasses and low shrubs such as blueberries and sweet fern, all less than a foot high underneath the pines, make up the groundcover. Since the proposed project is located on cleared land, and the surrounding forests are composed of quaking and bigtooth aspen, Kirtland's Warbler are not thought to frequent the project area. (11)

2.38 The Indiana bat frequents natural cavities in the cave country of the Eastern United States. Although specimens have been recorded as far north as Grosse Isle in Michigan, lack of suitable habitat indicates that Northern Michigan is not in its range.

A bald eagle nest has been reported to exist approximately 1/2 mile from a dredging site. Although it is unverified, possible dredging effects on the reported eagles are addressed in Section 4 of the FEIS (paragraph 4.23).

2.39 In addition to the above listed species, the species included in the Michigan rare, threatened, and endangered species program which are found in Emmet County are shown in Table II-3. Investigations at the project sites on Snider Road indicate that none of the species listed in Table II-3 are present.

2.40 Four-toed salamanders are generally found associated with decaying logs in wet woods near the ponds or bogs which they require for breeding. Thus, this species would not be expected to inhabit the project site. Wet, wooded habitats are also preferred by the five-lined skink and wood turtle, and these species also would not be expected at the project site.

2.41 Eagles and osprey generally are found in Michigan in areas associated with water. Nesting success is currently monitored by Fish and Wildlife Service (FWLS) and Forest Service biologists. In addition to the eagle nest discussed above, several eagle and osprey nests have been found in Emmet and Cheboygan Counties. The closest location is approximately 1 mile from where channel maintenance could take place, in an isolated area.

2.42 In the last three years, only 7 nesting sites for Cooper's Hawk have been known in Michigan, and none of these are in the vicinity of the project site. The Piping Plover is a water bird which feeds on aquatic life, such as crustaceans and mollusks, and has normally been found along the shores of the Great Lakes. This bird normally nests along undisturbed flat pebbly beaches above the water line and below the dunes. The only known nesting area in Emmet County is at Waugoshance Point, and breeding success in this area is in doubt. (11)

2.43 Few records of the southern bog lemming, which should be expected in wet, grassy areas have been taken in recent years. Since this is a runway making vole, its presence should be readily apparent. However, there is no evidence that it inhabits the proposed project area. The pine vole also prefers grassy areas, although it is less conspicuous since it generally lives in underground burrows, rather than using surface runways. As such, this species may be found at the project site, although no evidence of its presence was observed.

2.44 The lake sturgeon has been placed on Michigan's Endangered and Threatened Species Program as threatened. Correspondence with the University of Michigan's Biological Station at Pellston, indicated that the major sturgeon spawning areas for the Inland Route are Burt, Mullet, and Black Lakes. The proposed project is expected to have no significant impact on this important fishery.

Table II-3

RARE, THREATENED AND ENDANGERED SPECIES  
IN EMMET COUNTY, MICHIGAN\*

---

Plants:

Woodsia obtusa, Blunt-lobed woodsia, threatened.  
Psilocarya scripoides, Bald-rush, threatened.  
Iris lacustris, Dwarf lake iris, threatened.  
Calypso bulbosa, Calypso or Fairy-slipper, threatened.  
Cypripedium arietinum, Ram's head lady-slipper, rare.  
Orchis rotundifolia, Round-leaved orchid, threatened.  
Agropyron dasystachyum, threatened.  
Beckmannia syzigachne, Slough grass, threatened.  
Bromus pumpellianus, threatened.  
Zizania aquatica vars. interior and aquatica, Wild-rice,  
threatened.  
Potamogeton hillii, threatened.  
Cirsium pitcheri, Hill's thistle, threatened.  
Senecio congestus, probably extinct.  
Solidago houghtonii, Houghton's goldenrod, threatened.  
Tanacetum huronense, Lake Huron tansy, threatened.  
Pterospora andromedea, Pine-drops, threatened.  
Pinguicula vulgaris, Butterwort, threatened.  
Filipendula rubra, Queen-of-the-prairie, threatened.

Animals:

Hemidactylum scutatum, Four-toed Salamander, rare.  
Eumeces fasciatus, Five-lined skink, rare.  
Clemmys insculpta, Wood turtle, rare.  
Pandion haliaetus, Osprey, threatened.  
Haliaeetus leucocephalus, Bald eagle, threatened.  
Accipiter cooperi, Cooper's hawk, threatened.  
Charadrius melanotos, Piping plover, threatened.  
Synaptomys cooperi, Southern bog lemming, threatened.  
Microtus pinetorum, pine vole, threatened.

---

\* Michigan Department of Natural Resources, Michigan's Endangered and Threatened Species Program, Lansing, MI, Dec. 1976.

J. Air Quality

2.45 The Michigan Air Pollution Control Division monitors air quality at selected stations throughout the state. Michigan air quality standards are identical to the national standards. National Ambient Air Quality Standards as set forth in the Federal Clean Air Act define the "maximum allowable ambient concentration for six pollutants: suspended particulate matter, sulfur dioxide, nitrogen dioxide, carbon monoxide, photochemical oxidants, and hydrocarbons. These six pollutants have come to be known as criteria pollutants. There are two standard or goal levels for each of these pollutants (see Table II-4). The primary standard is established to protect the public health. The stricter, secondary standard is designed to protect public health and welfare, which includes damage to buildings, plants and animals, and impairment of visibility." (12)

2.46 "A county is considered to be in violation of the standard if at any site, (a) the annual average is exceeded or (b) two or more excursions of an applicable 24-hour, 8-hour, 3-hour, or 1-hour average are detected. When criteria (b) is applied, two excursions constitute one violation, three excursions mean two violations and so on, since one excursion is allowed by the standards." (12)

2.47 "All sampling sites are selected and approved by the Air Quality Division. Selection of site location and type of sensors is based on scientific evaluation of locale, need, and nearby sources. Monitors are placed in all counties containing significant air pollution sources. No monitors in a county indicates the county is presumed in compliance with air quality standards, except for ozone." (12)

2.48 Air quality measurements in Emmet County are made at two locations near Petoskey, and thus are representative of the "worst-case" for this predominantly rural county. The 1976 sampling data for suspended particulate, sulfur dioxide and nitrogen dioxide are shown in Tables II-5, II-6, and II-7, respectively. Suspended particulate sampling showed compliance with both annual and short-term primary standards, but violations of the secondary 24-hour standard, as in the preceding three years. Levels recorded for nitrogen dioxide and sulfur dioxide were consistently well below applicable primary and secondary standards, as in the past several years.

K. Water Quality

2.49 Water quality problems are principally related to organic or oxygen-consuming wastes created by municipalities, industries and agricultural sources. Sediments, evolving from erosion, contribute nutrients from fertilizers and pesticides which add to the degradation process. Degraded water quality restricts water use for water supply, fishing, and body contact recreation. It also discourages development of the adjacent areas, especially for recreational purposes.

TABLE II-4  
NATIONAL AMBIENT AIR QUALITY STANDARDS<sup>(3)</sup>

	Primary	Secondary
<u>Suspended Particulates</u>		
(micrograms/cu. meter)		
annual geometric mean	75	---
max. 24-hr. conc.*	260	150
<u>Sulfur Oxides</u>		
(micrograms/cu. meter)		
annual arith. aver.	80 (.03 ppm)	---
max. 24-hr. conc.*	365 (.14 ppm)	---
max. 3-hr. conc.*	---	1300 (.5 ppm)
<u>Carbon Monoxide</u>		
(milligrams/cu. meter)		
max. 8-hr. conc.*	10 (9 ppm)	10
max. 1-hr. conc.*	40 (35 ppm)	40
<u>Photochemical Oxidants</u>		
(micrograms/cu. meter)		
max. 1-hr. conc.*	160 (.08 ppm)	160
<u>Nitrogen Oxides</u>		
(micrograms/cu. meter)		
annual arith. aver.	100 (.05 ppm)	100
<u>Hydrocarbons</u>		
(micrograms/cu. meter)		
max. 3-hr. conc.* (6-9 a.m.)	160 (.24 ppm)	160

\* not to be exceeded more than once a year per site.

NOTE: values in parts per million (ppm) are only approximate.

TABLE II-5  
MICHIGAN AIR SAMPLING NETWORK  
1976 SUSPENDED PARTICULATE SUMMARY  
(Concentrations Expressed in Micrograms Per Cubic Meter)

Site Location: County, City Address	No. of Smpls.	Max. 24-Hr. Hour	2nd Geo. Mean	Ann. Primary Ann.	Standards Exceeded*
				24-Hr.	24-Hr.
Emmet, Petoskey Emmet County Building J. H. Scorrer Home	Jan.- Dec. 55	345	229	32	1 2
	Jan.- Dec. 56	413	173	65	1 4

TABLE II-6  
MICHIGAN AIR SAMPLING NETWORK  
1976 SULFUR DIOXIDE SUMMARY  
(Concentrations Expressed in Micrograms Per Cubic Meter and (Parts Per Million))

Site Location: County, City Address	No. of Smpls.	Max. 1-Hr. Hour	Max. 3-Hr. Hour	Max. 24-Hr. Hour	2nd High Mean	Ann. Arith. Mean	Standards Exceeded*
						24-Hr.	3-Hr.
Emmet, Petoskey Jan.- Emmet County June Building	18			40	20	10 (0)	
				(.02)	(.01)		
Emmet, Petoskey Jan.- J. H. Scorrer May Home	21			30	20	10 (0)	
				(.01)	(.01)		

TABLE II-7  
 MICHIGAN AIR SAMPLING NETWORK  
 1976 NITROGEN DIOXIDE SUMMARY  
 (Concentrations Expressed in Micrograms per Cubic Meter and (Parts Per Million))

Site Location: County, City Address	Months Smpd.	No. of Smpls.	Max. 1- Hour	Max. 3- Hour	Max. 24- Hour	Ann. Mean	Standard Exceeded	
							Primary & Sec.	Annual
Emmet, Petoskey Emmet County Building	Jan.- May	22			40	20*		
					(.02)	(.01)		
Emmet, Petoskey J. H. Scorrer Home	Jan.- May	20			30	10*		
					(.01)	(.01)		

2.50 In general, water quality problems are a result of or a combination of bacteria counts, low dissolved oxygen levels, thermal loadings, high turbidity, nutrient (nitrogen and phosphorus) concentrations at levels that stimulate algae growth and development, and significant concentrations of pesticides and toxic metals.

2.51 Erosion and sedimentation increase the water quality problem. Because of the insufficient amount of organic matter returned to the soil from crop rotation, the soil does not retain the water as readily. Housing developments and road construction also contribute heavily to the sediment problem. Consequently, there is excessive surface runoff that transports loads of suspended sediments to the river. Due to the nature of the sediments (fine, clay soils) they remain in suspension for long periods of time.

2.52 A review of the Master Water Data Index maintained by the U.S. Geological Survey, National Water Data Exchange, and contact with the Michigan DNR, indicates that current surface water quality data is not available for surface waters in the vicinity of the project site (including the Maple, Crooked and Cheboygan Rivers). Thus, a quantitative measure of present conditions is not available. Qualitatively, surface water quality in the region is generally good.

#### L. Demographics

2.53 The 1975 population of Emmet County was 20,900. The 1970 population of Emmet County was 18,331, an increase of approximately 15 percent over the 1960 population of 15,904. The proposed site is located in Maple River Township, which had a 1970 population of 415, an increase of 80 persons in the period between 1960 and 1970. The population projections of the Emmet County Office of Planning and Zoning are as follows:

Populations Projections

	<u>1970</u>	<u>1980</u>	<u>1990</u>
Maple River Township	415	495	575
Emmet County	18,331	23,040	27,300

The County covers 295,040 acres (461 square miles), and has a population density (1975) of 45 persons per square mile.

2.54 Emmet County is a recreational center and is visited by people from all over the midwest in both summer and winter. The Emmet County Office of Planning and Zoning estimated a summer home population of 6,3000 persons on any given weekend in 1970. Based on the accommodations of recreational facilities (e.g., seasonal housing, motels, and hotels, and state parks), the county has a total tourist occupancy capacity of another 14,700 persons on any given vacation day. (13)

M. Land Use

2.55 Emmet County consists of 295,040 acres of land and inland waters. A county land use survey in 1969 showed that developed land uses occupied 22,869 acres; vacant, farm and forest lands comprised 262,415 acres; and surface water accounted for the remaining 9,756 acres. (13,14)

Table II-8 summarizes Emmet County land use characteristics.

2.56 Almost two-thirds of the county (194,332 acres) is forested with 67,515 acres in State ownership. Residential development in the area consists of several small communities located along the lakes and connecting rivers of the Inland Route. The largest community near the proposed project site is Alanson (1970 population 469), which is situated about 3 miles to the south west. Marinas and boatworks are the primary water oriented facilities situated downstream from the Alanson lock on the Crooked River.

2.57 Much of the development in the area is oriented towards tourist-related activities. While boating, fishing and swimming are the most significant summertime activities, winter sports such as skiing, snowmobiling, ice fishing and skating are also popular.

2.58 The transfer site is located on the right-of-way of Snider Road. Property adjacent to the site is mostly forested but some land has been partially cleared to accommodate homes. There are four homes within view of the proposed transfer sites, the nearest being approximately 15 yards from the site. Approximately 20 homes have been built in clearings along the Crooked River to the east of the proposed transfer site.

2.59 The proposed disposal site is located in a cleared area surrounded by Aspen forest on property owned by the Michigan DNR. Adjacent private property is comprised of Aspen forest and pasture lands.

N. Archeology

2.60 The National Register of Historic Places (1 February 1977) (15) and subsequent updates lists nine properties in Emmet County. All of the sites listed are more than 5 miles from both the disposal and transfer sites. Thus, the registered properties are not within the area of project influence. Communication with the State of Michigan Historic Preservation Officer regarding the disposal and transfer sites indicates that the project would have no effect on the historical and cultural resources of the area (see Appendix D). Michigan State University has conducted surface surveys of archaeological resources in the project area. They reported five archaeological sites within a one mile radius of the Alanson Lock and Weir, but their survey revealed no surface evidence of the sites. Three archaeological sites have been reported within a one mile radius of the transfer and disposal sites. The transfer site possessed no surface indications of archaeological materials. The disposal site was not given a surface survey

Table II-8  
LAND USE EMMET COUNTY

	All Townships (acres)	Cities & Villages (acres)	Total County (acres)	Percent	
				Developed	Total
Residential	1,391	703	2,094	9.1	--
Seasonal Homes	778	37	815	3.6	--
Public	2,357	154	2,511	10.9	--
Quasi-Public	2,754	301	3,055	13.4	--
Recreation	7,372	206	7,578	33.1	--
Commercial	203	129	332	1.5	--
Industrial	429	114	543	2.4	--
Railroads	374	102	476	2.1	--
Roads	4,830	635	5,465	23.9	
Total Uses	20,488	2,381	22,869	100.0	7.8
Vacant, Farm & Forest	258,932	453	262,415		88.9
Surface Water	9,485	301	9,756		3.3
Total	288,905	6,135	295,040		100.0

Source: Villican-Leman & Associates, Inc., Farmers Home Administration Comprehensive Sewer and Water Plan for Emmet County, April, 1971, Field data current through November 1969

because it is in a low potential area based upon surveys in similar environmental situations. Michigan State University concluded that there would be no adverse impacts to archaeological sites in the area. (Please refer to the Comments and Response Section). The Heritage Conservation and Recreation Service, U.S. Department of Interior, also concluded that the proposed project would have no potential adverse impacts on cultural or other environmental resources within their area of jurisdiction and expertise.

2.61 The results of archeological investigations published in 1931 (16) enumerates Indian sites identified in Emmet County as nine villages, five burying grounds, and two mounds. Five villages, three burying grounds, and six mounds are identified in adjacent Cheboygan County. The majority of these Indian sites are located on the shores of Lake Michigan, and none are located within 3 miles of the project site. More recent investigations (17) did not reveal archeologic sites in the project area.

#### 0. Sociology and Economics

2.62 The 1970 Census of Population, Bureau of the Census, indicated that the median annual income for Emmet and Cheboygan Counties is \$8,608 and \$7,659, respectively. The employment characteristics of the two counties are summarized in Table II-9. As shown, employment in the project area is relatively well distributed between industrial, government and white collar occupations. Total employment in 1970 in Emmet and Cheboygan Counties was 6261 and 4867, respectively, while the total civilian labor force was 6891 and 5724, respectively. (18)

TABLE II-9  
EMPLOYMENT IN EMMET AND CHEBOYGAN COUNTIES, MI

Industries	Emmet Co. (%)	Cheboygan Co. (%)
Manufacturing	15.5	24.2
Wholesale & Retail Trade	25.8	21.8
Services	10	8.3
Educational Services	7.9	8.4
Construction	9.2	8.8
Government	14.6	16.9
White Collar Professionals and Managerial	23.8	18.8
White Collar Sales and Clerical	21.9	20.8
Craftsmen and Foremen	14.5	15.5

Source: U.S. Bureau of the Census, City and County Data Book, 1972. Government Printing Office, Washington, D.C.

### III. THE EFFECT OF THE PROPOSED ACTION ON LAND USE PLANS

3.01 A comprehensive land use plan for Emmet County, including Maple River Township, was developed in 1971. (13) The disposal and transfer sites are located in an area designated as a farm and forest zoning district. The purpose of the farm and forest designation is "to promote the use of wooded and rural areas of the county in a manner that will retain the basic attractiveness of natural resources and provide enjoyment for both visitors and the community at large. The intent of the district is to hold the rural county areas for agricultural and forestry purposes and to allow some multiple uses of marginal farm and forest lands". (19) Residential development, as well as utility and public service facilities are permitted.

3.02 The transfer site is located in an area which is also designated as a scenic resources zoning district. This district is "established to protect scenic resources along the rivers, highway, streets, lake shores, and impoundment waters". (19) Utility and public services facilities as well as boat launching pads and minor accessory facilities are also permitted in this zoning district. However, it is required that any excavating, filling, grading, or other on-site construction activity shall insure that silting will not impact adjacent waters. In addition, all banks, slopes, and hillsides must be stabilized to prevent soil erosion. These and other best management practices for surface runoff control along the Crooked River may eventually aid in the reduction of sedimentation and the corresponding need for future maintenance dredging.

3.03 Correspondence with state and local authorities will be carried out to insure that design of the proposed facility is consistent with these requirements. Thus, the proposed disposal and transfer facilities do not conflict with the existing zoning and land use plans in Emmet County in general, and Maple River Township in particular.

3.04 Since the proposed disposal site is located in the Hardwood State Forest, the compatibility of the site with the Forest Management Plan (9) must be considered. The management plan is based on a multiply-use policy, which focuses primarily on forest products production, wildlife habitat and recreational uses.

3.05 The Hardwood State Forest in the immediate vicinity of the proposed disposal site is mostly covered in poor quality aspen. As a result, the management plan for this area gives priority to maximization of wildlife habitat through creation of open areas. Since the proposed disposal facility will involve clearing 2.8 acres of aspen and subsequent seeding of the site with grasses, it is consistent with the Hardwood State Forest Management Plan.

#### IV. PROBABLE IMPACT OF THE PROPOSED ACTION ON THE ENVIRONMENT

4.01 Dredging of the Inland Route channel to the justified controlling depths, disposal of the dredged material, and the proposed public use facilities are a basic activity and responsibility of the Corps of Engineers. This requires the removal of quantities of sediment that must be disposed of economically but with the least possible adverse environmental impact. Effects of the proposed project on the environment can be discussed in terms of general impacts, beneficial impacts, dredging impacts, disposal impacts, and public use facilities construction impacts.

4.02 Environmental impacts may result from surveys and inspections, after dredging survey inspections, transport of dredged material, disposal of dredged material, and construction of structures at the lock and weir.

##### A. General Impacts

4.03 This section presents a discussion of environmental impacts that are common to each of the activities or that result from the cumulative effect of the overall project.

4.04 The climate, physiography and topography, and geology would not be affected by the project, but rather have an impact on the project. For instance, climatic conditions dictate what time of year it is feasible to dredge the Crooked River. Natural environmental components affected by all activities or by a combination of the activities include: terrestrial flora and fauna, hydrology, sediment, aquatic vegetation, plankton, aquatic invertebrates, fisheries, and overall quality of the natural environment. The impacts associated with these components are discussed in relation to each activity.

4.05 Survey launches and tugs are powered by inboard, outboard, or inboard-outboard motors, and can, therefore, be expected to release very minor amounts of contaminants. Oil and grease contaminants, especially hydrocarbons and carbon monoxide, would be released into the atmosphere of the project area, producing temporary, low magnitude adverse impacts. The impacts are partially mitigated by the fact that all Corps of Engineers and contract vessels are in compliance with USEPA standards for the control of smoke and fume emissions. A temporary adverse aesthetic impact of low magnitude would result from the presence of operation and maintenance equipment in the waterway when viewed by persons wishing to observe this setting from the adjacent shoreline. Launches used for survey and inspection operations and vessels used for the dredging would cause a temporary inconvenience to those navigators who must avoid the work areas. Operation of project vessels could result in a temporary increase of noise levels in the immediate area. The dredging plant is required to have water-tight equipment and components which must be maintained in order to

prevent spillage of oils and dredged materials. Provisions for the control and elimination of accidental waste material spills are provided by the U.S. Coast Guard.

4.06 The impact of the proposed dredging activity on terrestrial wildlife and plantlife in the immediate vicinity of the surrounding shoreline would be insignificant and of a temporary nature. Waterfowl, songbirds, and shorebirds using the adjacent areas might be driven away by the dredging activities and noise. Construction of the disposal site would disrupt approximately 10 acres of biologically productive land. Removal of all vegetation within a project area also removes or destroys wildlife dependent on the area for feeding, breeding, resting, hiding, and other requirements of life cycles. The combination of factors, which results in the present biotic communities, would be altered permanently by the project, resulting in a succession of plants and animals using the area throughout construction, operation, and maintenance. Usually, plants govern the development and influence the total species composition. Also, plants indigenous to the area which have survived under prevailing conditions will normally revegetate an area undergoing secondary succession. However, replacement of existing land with unconsolidated, nutrient enriched fill, creation of possible higher drier conditions, and changes in microclimates introduce conditions which may attract different communities of flora and fauna.

4.07 Construction of the disposal site would involve clearing 2.8 acres of restocked aspen forest. Since the Blue Lake soils in the area of the disposal site are relatively infertile and not capable of supporting high quality stands of timber, the Michigan DNR Forest Management Division management plan for the area (9) calls for maximizing wildlife habitat in preference to timber production or recreational development. In order to accomplish this objective, the DNR proposes to clear small five acre stands of timber (totaling approximately 100 acres) in the area and seed these clearings with grasses for use by grouse and deer. Thus, clearing of forested land and subsequent seeding of the disposal site with grasses would be beneficial to wildlife habitat and would not significantly impact on the forest resources of the area.

4.08 Components of the existing human environment which are not expected to be directly affected by the dredging and disposal operations are demographic and cultural resources. However, these components would be indirectly affected to a moderate degree on a long-term basis. Continued maintenance dredging would allow for the continued use of the waterway for recreational navigation. In addition, economic interests associated with recreational boating in the area, such as marinas and fishing supply stores, would also benefit.

4.09 The project is not expected to directly affect area residential structures adjacent to the river or the lock and weir structures.

Thus, no persons would be displaced or required to relocate. The proposed activity may have a long-term beneficial effect of medium magnitude on the river area's population by continuing to support existing residents and helping to attract new residents, seasonal or permanent, to the community. The project would have no direct or indirect short or long-term adverse effects on local parameters indicative of community cohesion, such as private clubs and civic group participation.

4.10 The proposed project would have neither a beneficial nor an adverse short-term effect on local housing parameters, such as repair and maintenance of existing structures, changes in home ownership or percent of owner occupied homes. This project, and future operation and maintenance projects in the area, would have a long-term beneficial effect of moderate magnitude upon these parameters by preserving the desirability of the waterway for recreational navigation. Dredging would not destroy land areas, nor is it likely that it would stimulate a change from current occupancies.

4.11 Area residents obtain their water from wells. No significant impact on these wells or the water supply is anticipated because of the depth and distance between the wells and the project area. Boring logs (Appendix C, page c-3) taken at the proposed disposal site showed a clay layer that would provide a natural layer of protection against groundwater contamination.

4.12 There are no known sites of archaeological importance in or adjacent to the proposed project areas. The dredging would take place in an area that has been influenced by maintenance operations in the past. Should dredging personnel discover objects of possible archaeological or cultural significance, operations will cease and consultation would be sought with the State of Michigan to evaluate the find and to supervise salvage operations, if needed. Clearance of the proposed disposal site was obtained from the State Historic Preservation Officer (Refer to Appendix 2).

4.13 Moving the dredge material from the transfer site to the disposal site would involve the transport of the material over a local residential road. Maple River Township records of the area show a total of two permanent and one seasonal homes along the truck route. It is expected that the trucks would make 20 round trips a day between 8AM and 4:30 PM, five days a week. Duration of the operation has been estimated at 4 months for the initial dredging, 2 months at the 5 year period, and 3 months for the final (tenth year) dredge period. Noise output for this type of equipment is in the range of 70-95 decibels (dBA) at 50 feet and 44-69 dBA at 1,000 feet from the source.<sup>(30)</sup> For comparison, the expected decibel rating for a quiet residential neighborhood is 40 dBA. The average amount of noise expected from this work would fall within acceptable limits for the type of use expected for the proposed operations. Trucking the material would also result in a temporary increase of dust during the operation. Local regulations and codes would be met.

## B. Dredging impacts

4.14 Dredging of sediments in the navigation project of the Inland Route, Michigan, would affect the natural environment in three areas: effects on water quality; effects on the benthic region of the channel; and effects on macro-organisms inhabiting or using the waterway. Effects on each of these areas are discussed in greater detail below.

4.15 Effects on Water Quality. Upon the initiation of dredging operations, temporary increases of localized turbidity will occur. This turbidity can restrict biological productivity in a number of ways; however, the two most significant with respect to water quality are the restriction of light availability to photosynthetic organisms and aquatic flora and the possible resuspension of incompletely digested benthic material. With respect to light availability, large amounts of suspended material will tend to scatter (diffuse) light, resulting in decreased penetration from the water surface and a subsequent decrease in productivity of organisms dependent on this type of energy.

4.16 Oxygen Demand (OD) in sediment deposits is due largely to organic matter being utilized by micro and macro benthic organisms. In the undisturbed state, highly organic sediment is usually in an anaerobic condition, with the exception of that portion of the sediment at the sediment-water interface, where reactions can be aerobic. Highly organic sediments can contain potential OD several orders of magnitude above the Dissolved Oxygen (DO) saturation level. The resuspension of partially digested organic matter and sludge will cause increases in the oxygen demand with resultant decrease in the dissolved oxygen content of the affected water. This effect will be temporary and localized. Recovery time for a depressed DO concentration is a function of flow patterns and the physical characteristics of the sediment. Good mixing may provide a dilution factor. However, Isaac (1962) observed that resuspended sediment exerts more OD than in-site material, and Martin and Bella (1971) noted that mixing tends to increase oxygen uptake. Oxygen dependent motile organisms and nektonic species will tend to avoid the area until this turbid condition subsides and normal Dissolved Oxygen levels are restored.

4.17 Heavy metals are present in the environment naturally, although they are now being added in large quantities by the activities of man. Water-borne vessel operation and maintenance, municipal and industrial waste discharge and non-point sources, e.g., storm water and agricultural runoff, contribute considerably to heavy metal content of sediments. Recent data indicate that the most heavy metal accumulation occurs in the top 20-40 cm. of sediment and decreases with increasing depth. The implication of this fact is that the depth of dredging is of minor impact to the problem of heavy metal release/resuspension since the bulk of the accumulated heavy metals would most likely be removed with even the most shallow of dredging operations. Toxic heavy metals would, therefore, not progress into higher levels of the food chain in detectable quantities. Extensive research recently done by the Corps' Waterways Experiment Station in Vicksburg, Mississippi, has shown that there is an insignificant amount of toxic metal released to the water due to the resuspension of sediments during dredging operations. It was found that toxic

metal laden sediments resuspended in the water column would resettle with no more effect on the water environment than those associated with the resuspension and settling of uncontaminated sediments.

4.19 Because of these dredging operations, it is doubtful whether any rooted aquatic plants exist in this portion of the channel. Turbulence induced by current, and propeller wash from recreational craft, in addition to disturbances attributable to ice movement, would also tend to limit their numbers and stage of development. Any rooted aquatic vegetation or sessile benthic organisms that has colonized these areas since the last maintenance operation would be removed by the proposed work.

4.20 The proposed dredging operations would result in a temporary reduction in productivity in the dredging locale and areas immediately adjacent to it. This condition will arise as a result of increased turbidity and consequent siltation in these areas. Settlement of these resuspended materials may promote the formation of soft sediments or "floc" which is not conducive to the colonization or propagation of desirable benthic organisms.

4.21 Changes in the benthic populations of the waterway would result in the loss of potential food organisms for resident fish populations. However, unaffected and adjacent areas and nearby Crooked and Burt Lakes would provide substantial and sufficient food organisms. Prior maintenance dredging has produced no noticeable effects on resident fish species. In general, fishermen have noticed that their fishing improves when following behind a dredge during dredging operations. This temporary effect is due to the initial release of infaunal food sources.

4.22 Effects on Macro-Organisms. The resuspension of bottom sediments, mainly in the form of finer, slower settling silts and clays, cannot be considered beneficial to aquatic organisms, particularly fish. As discussed previously, resuspension of bottom sediments normally leads to a reduction in the dissolved oxygen concentration of the affected waters. Resuspended benthic material, if present in sufficient quality, can result in damages to the respiratory organs; e.g. gill fibers and filaments, of fish. However, this effect is anticipated to be minimal due to avoidance behavior to these conditions exhibited by fish. Fish instinctively move away from highly turbid or low DO areas. Fish eggs and young would be removed by the proposed dredging or smothered by the settling sediments. The sphere of influence of these impacts are greatest in a localized area immediately around the dredge. As the distance increases from the dredge the severity of these impacts taper off. With the dredging taking place in a river, it can be expected that these adverse water quality conditions would be spread further downstream than in a still water environment. However, the impacts would be mitigated by the dilution affect of the water. A beneficial side of the resuspension of benthic material is that there is made available to the local fish populations a temporary abundance of food which had been bound up in

bottom sediments. Coordination would be carried out with the Michigan Department of Natural Resources (MDNR) so as to schedule the proposed activities during times that would least impact the fishery resources of the river.

4.23 Effects on Threatened and Endangered Species. There would be no effect on any threatened or endangered species on either the Federal or State of Michigan lists. An active bald eagle nesting site has been reported to be approximately  $\frac{1}{2}$  mile from the Crooked River-Crooked River Pickerel Lake channels. The bald eagle (Haliaeetus leucocephalus) is a U.S. endangered species in conterminous states other than Washington, Oregon, Minnesota, Wisconsin, and Michigan. In the latter states it is a threatened species. It is also a State of Michigan threatened species. Current U.S. Fish and Wildlife Service Bald Eagle Management Guidelines imply no significant project effect on either the nesting pair or their offspring (Bald Eagle Management Guidelines, Twin Cities, Minnesota Regional Office, U.S. Fish and Wildlife Service, 11 June 1979). The project area is much beyond the primary (330 feet) and secondary (660 feet) nest protection zones. Project activities would not result in loss of potential nest sites. There would be no significant effect on bald eagle feeding activities. There would be no significant effect on the fishery (Paragraph 4.21), so there would be no indirect effect on feeding through food availability. The channel is heavily used by recreational boater, water skiers and fishermen. Because dredging noise is comparable to that of recreational craft, a significant noise increase would not occur during dredging. There would be no destruction of roosting sites. To date the U.S. Fish and Wildlife Service has been unable to verify the existence of the nest. As a precautionary measure, if the presence of the nest is verified, dredging in project areas within approximately 1 mile from the nest would be suspended between 1 February and 31 July to avoid any possible adverse effects.

#### C. Disposal Impacts

4.24 Potential adverse impacts associated with construction and operation of the disposal site include destruction and disruption of wildlife habitat and vegetation. Construction of the disposal site would require removal of existing vegetation. Destruction of site vegetation in conjunction with noise resulting from site construction and operation would temporarily make the disposal site unsuitable for wildlife habitat. It is anticipated that initial construction and disposal of backlog dredged materials could require approximately six months. Following backlog dredged material disposal and revegetation of the disposal site, the area could provide improved wildlife habitat.

4.25 It is projected that maintenance dredging would be performed at intervals of approximately five and ten years following completion of backlog dredging. Each subsequent maintenance dredging operation is anticipated to disrupt wildlife usage of the site for approximately three months. Following disposal of dredged material from maintenance operations at these intervals, the site would again be revegetated and could provide desirable wildlife habitat.

4.26 Placement of dredged material at the disposal site has the potential for contamination of surface runoff with suspended solids, organic matter, and heavy metals. However, the potential for surface water contamination has been effectively eliminated through appropriate site design. The dredged material placed on the disposal site would be contained within a graded area. The area is designed to provide containment of all precipitation which falls on the site, so that there would not be any runoff from the disposal area. Plants that would revegetate the disposal site could provide a pathway for heavy metals into the area's food chain. The heavy metal loading of area vegetation is not expected to concentrate sufficient quantities of these metals to provide for an environmental hazard. Please refer to Page V-2, section d, paragraph 2 and Table V-1 for more details.

4.27 Sediments in the Crooked River are anaerobic and could temporarily generate objectionable odors when removed from the river and placed in the disposal site. However, odors would persist only as long as the material remains anaerobic. To facilitate development of aerobic conditions, the disposal site is designed to provide for disposal for dredged sediments at a depth of no more than 9 inches. Disposal of the material in this manner would permit rapid oxidation of the dredged material and minimize odor generation. In addition, application of a relatively thin layer of dredged material will prevent significant interference with the well-drained characteristics of the existing soils.

4.28 Ducks and geese are occasional migrants in the area of the proposed disposal site. Minor outbreaks of duck poisoning (C-type Botulism) have occurred at some confined disposal areas, both during disposal operations and following heavy rainfalls. Anaerobic conditions conducive to the occurrence of botulism are recognized. It is possible to take remedial action should botulism occur on the site. This action is dependent on identifying those conditions favorable to the bacteria as they exist on the site. Optimum conditions include warm, shallow water areas, with little or no circulation, and the presence of organic food sources in the sediment which support anaerobic organisms. Since dredged material would be placed at the disposal site in a relatively thin layer and the soils at the site are well drained, standing water should be a very shortlived occurrence. Thus, construction and operation of the disposal site as proposed should effectively eliminate the hazard of duck poisoning. Disease vector (mosquitos and other nuisance insects) problems will also be alleviated by the elimination of any standing water at the site.

4.29 Construction of the proposed site would result in a temporary unsightly development, aesthetically displeasing to residents of the area. Furthermore, during operation of the facility there exists a possible danger to children in the vicinity accustomed to exploring the site as a natural area.

4.30 The disposal program as now contemplated would not encroach upon any major marsh areas existing in the vicinity. Although approximately 10 acres of open field type terrain and some trees would be destroyed by the fill, the area appears to be devoid of any unique flora and fauna.

4.31 Discomforts caused by the construction and disposal work would be a temporary impact or the life of the project. Most of the noise, dirt, and traffic would be associated with the formation of the confinement facility. Noise from the dredging operation and the hauling of the dredge material to the disposal site would be noticeable; however, operations would be carried out during normal working hours. Odors associated with the dredged material have been described as septic by the USEPA. Any odors released by the disposal operations should be short-lived as the odors are biologically degradable.

4.32 Protective measures to prevent the dredge materials from returning to the adjacent hydrologic system will be provided by the constraints inherent in the design plans. Dredge material trucked to the site will be very low in water content, and in filtration of this material or its components over 8.6 acres is expected to be minimal. Ground water contamination by the dredge material would not occur, therefore monitoring of adjacent water sources will not be carried out. Results from the study of established disposal sites for maintenance dredging have substantiated that the methods of disposal and confinement designed for this project should adequately contain the contaminants. Effluents, whether airborne or waterborne, will conform to regulatory standards established by Federal, State, or local authorities.

#### D. Transfer Site

4.33 The unaesthetic appearance of the transfer facility during construction and operation is a potential adverse impact which can be mitigated. Construction equipment and supplies would be aesthetically inconsistent with the natural setting of the transfer site. In order to mitigate this impact, the duration of the construction activities would be kept to a minimum, as would the duration of equipment storage. Following completion of construction activities, the transfer site would have much the same appearance as other Crooked River shoreline within view of the site.

4.34 Transport of dredged material to the disposal site may generate excessive dust along the haul route since it is unpaved. The magnitude of the dust problem would depend on prevailing weather conditions. Since it is anticipated that disposal operations would be conducted in the spring and/or fall in order to minimize interference with recreational boat traffic, normal precipitation during these seasons should minimize dust problems. However, if unseasonably dry conditions are experienced, the haul route would be watered to minimize dust generation and resulting inconvenience to neighboring residents. The dredged material would be hauled in a semi-dry state, thereby reducing the potential of spillage during transport. If a problem arises, sealed trucks could be used.

4.35 Increased noise levels associated with construction and operation of the transfer site also may be an inconvenience to neighboring residents. The majority of the residences in the area of the transfer site appear to be seasonal, and disposal operations will be conducted in the off-season, with resulting mitigation of noise impacts. In addition, work will be carried out only during the normal working day.

#### E. Public Use Facilities

4.36 Woodlands. Wooded stream banks help to prevent shore damage, reduce siltation in adjacent waterways, stabilize water temperature, and reduce flooding. The dense, protective shelter is important as protection for wildlife in the winter.

4.37 The grove of cedar trees in which the proposed trail is to be placed is small, and impacts to ground, river, storm and flood waters, as a result of the proposed action should be minimal. Impacts to wildlife inhabiting the cedar stand would be caused by the vegetation destroyed by the woodchip fill, subsequent visitor usage, and by the noise associated with the proposed activities. The area to be filled with woodchips would be approximately 900 square feet in size. The parking lot and storage building would be built on a site that was used as a fill area for material removed during the original construction of the lock and weir in 1967. The site is currently covered with a secondary growth of various grasses, weeds, and woody brush. The proposed activity is not expected to impact surrounding stands of trees. Impacts on the surrounding habitat and wildlife are expected as a result of increased visitor use and not the proposed structural changes.

4.38 Effect on Water Quality. Driving piles for the pier and constructing a trail near the shore would cause minimal, local turbidity in the Crooked River. Because of the silt present in the bottom deposits, disturbance of the sediments could result in moderate reduction of the water's light transmission. Corresponding rise in COD and decrease in dissolved oxygen (DO) could cause minor, temporary negative impacts to planktonic, nektonic, and benthic organisms. Fish could avoid the area because of the increased turbidity, but should return when the project is completed. Since the proposed activity is minor in scope, only negligible amounts of materials should become redissolved. Overall impacts to water quality should be minimal.

4.39 Effect on Submerged Vegetation. Any flora located where the piles would be driven would be destroyed. Also, turbidity produced from this activity could have a temporary, minimum impact on other plants in the area by sedimentation or reduction in light transmission. Overall impacts to submerged vegetation in the area are expected to be insignificant.

4.40 Effect on Benthos. The only benthic organisms expected to be significantly impacted by the proposed project are those in the immediate vicinity of the walkway support pilings. Organisms in these areas would be severely impacted. No impact on the food chain or species diversity of aquatic organisms in the river is expected as a result of the loss of these organisms; so, the importance of this impact is insignificant.

4.41 Effect on Erosion. The proposed activity would temporarily increase the amount of sediments in suspension, but no increased erosion potential is anticipated, though sediments may accumulate on adjacent areas. The wood-chip covering of the trail would reduce erosion of the fill.

4.42 Effect on Flood Stages. The proposed activity should not significantly impact flood stages.

**4.43 Effect on Threatened and Endangered Species.** The lake sturgeon has been identified in the area. This species is listed on the Michigan Endangered and Threatened Species Program as threatened. The proposed project or any of its related activities would not affect the species nor its habitat. Known spawning areas have been identified in tributary waterways downstream of the project site. No other known endangered or threatened species, as represented on the U.S. Fish and Wildlife and State lists, would be affected by the proposed activities.

**4.44 Aesthetics.** Many visitors come to this area because of its undeveloped, natural character. The presence of an overhead walkway, a pier, sightseers on both banks, and a storage building would have an impact upon this area's natural appearance. Both the boaters on the river and the people visiting the facility could find portions, if not all, of the project visually displeasing. However, efforts would be made to blend the proposed structures into its surroundings through the use of natural materials (wood) and area restoration of plant life.

**4.45 Recreation.** Sightseeing activities would be substantially enhanced by the proposed facilities. The walkway, parking lot, and wood chip trail would provide for greater use of the area's waterway by local, as well as, transient fishermen.

**4.46 Economics.** In addition to the initial construction, the proposed project could call for hiring part-time personnel to maintain the proposed facility. Local businesses would benefit from the expected increased tourist business that the proposed facilities would enhance.

#### F. Relationship to Other Navigation Projects in the Vicinity

**4.47** Maintenance dredging of the Inland Route as authorized by the River and Harbor Act of 3 September, 1954 includes the Crooked River between Crooked and Burt Lakes. Continued use of the Crooked River requires periodic maintenance dredging. Since the Crooked River sediment is unsuitable for open lake disposal, the proposed project is required to insure continued use of the Crooked River by pleasure craft from the Great Lakes and other portions of the Inland Route.

**4.48** There are no other public navigation projects in the vicinity which would affect or be affected by the proposed project. Private navigation projects are generally limited to small boat slips or piers constructed by waterfront residents.

#### G. Conclusion

**4.49** The proposed project would benefit the owners and operators of recreational craft and associated economic interests, such as marinas, on the Inland Route. Proposed activities would affect noise, air and water quality, and flora and fauna of the project site. However, these impacts are expected to be temporary and minor in nature.

4.50 Section 122 of Public Law 91-611 presents possible areas of impact that should be considered in relation to the proposed operations. These areas include, but not limited to:

Noise	*Public Services
*Displacement of People	*Desirable Regional Growth
Aesthetic Values	Employment
*Community Cohesion	Business and Industrial Activities
Desirable Community Growth	*Displacement of Farms
Tax Revenues	*Man Made Resources
Property Values	Natural Resources
Public Facilities (including water supply)	Air Pollution Water Pollution

Listed areas in front of which an asterisk (\*) appears are not expected to be affected significantly by the proposed action. The remaining areas have been discussed in greater detail throughout Sections 4 and 5.

4.51 Generally, dredging operations cause temporary, localized problems attributed to turbidity, suspended solids, and sedimentation. During dredging, nutrients and heavy metals may be released from the sediments where they have been in a stable, non-reactive status. Water quality, nektonic, planktonic, and benthic habitats may also be adversely affected. Benthic organisms will quickly recolonize the dredged area, but species diversity could be reduced. Due to the dredging and disposal, the species composition may never reach a true balance, and maximum sustained population density may never be achieved.

4.52 Dredged material unsuitable for open lake disposal has limited value to the local community because of the Public Law 91-611 governing the disposal of material in a confined disposal facility. That is to say that this dredge material can't always be placed for the optimum use by the local community due to the limitations imposed by the construction and operation of a confined disposal facility.

4.53 On 5 September 1975 the EPA published regulations for discharge of dredged or fill materials in navigable waters (40 CFR 230). This regulation requires that consideration be given to wetlands, fisheries, shellfish, water quality, benthic organisms, submerged vegetation, nutrients, turbidity, rare or endangered species, wildlife and recreation. Each of these items has been addressed in detail in preceding paragraphs of this section and other sections of the report. In accordance with paragraph 230.5 of this regulation, plans include all practicable measures to minimize adverse effects and enhance beneficial effects. The proposed action is in full compliance with the requirements of the regulation. The Water Resource Council's "Principles and Standards" were also consulted and followed throughout the preparation of this environmental statement.

4.54 On 22 July 1975 the Corps of Engineers published regulations covering all of its dredging operations. This regulation, 33 CFR 209.145 has provisions for issuance of a public notice, holding of public meetings or hearings, coordination of planning with State and Federal agencies, and final approval of disposal sites by EPA. All of the requirements of this regulation will be met prior to beginning construction of the project.

4.55 The impacts of maintenance of the structures at the lock and weir facility would normally consist of cleaning, in-place repair of lost or damaged portions. The impacts would be identical with, but lesser in extent and duration than, impacts associated with the original construction of the facilities. The proposed construction of the public use facilities, in itself, would have minor impacts on the environment. However, the cumulative impact of many such minor actions could be significant. The protection of natural shoreline which adjoin waterways is important in terms of the water quality and temperature of the waterways, flood levels, and groundwater replenishment. Since private and commercial development of the area has had an effect on the aesthetics and environment of the Crooked River, additional impacts should be avoided unless such development is in the public interest. In this case, the public benefit from use of the 900 square feet of shoreline to be filled for the trail is considered to outweigh the adverse impacts. The increased use of the area by tourists would also result in increased amount of litter.

4.56 The following narrative discusses the probable impacts of maintenance dredging on the environment.

4.57 Maintenance dredging would impact the project in two basic areas: the recreational channel of the Crooked River, during and after the actual dredging operation, and the disposal area.

4.58 Dredging would produce a series of short-term impacts, such as a disruption of boating and sportfishing, noise, and water quality deterioration. These impacts should have little lasting effect on the ecology of the dredged areas.

4.59 The areas to be dredged (see Figure I-2) experience continued movements of sediments as materials are deposited and redistributed by the current of the Crooked River, recreational craft propeller wash, and ice movement.

4.60 If present, bottom organisms and aquatic plant growths would be removed along with the dredged materials.

4.61 Although not extensively studied, the dredged areas should be repopulated by benthic species. Repopulation of organisms, which are mobile or prolific reproducers, would begin upon settling of the suspended solids. Other less prolific sedentary organisms would require longer periods of time before repopulation is complete.

4.62 Water quality in the areas to be dredged would be impacted by increased turbidity caused by the proposed operations. This temporary increase in turbidity caused by suspended solids would reduce light penetration. Depending on the degree of light loss, the life cycle of certain organisms could be adversely affected. A temporary depression in the Dissolved Oxygen concentration in the water at the operational sites would also occur. Fish species inhabiting these areas would tend to avoid these conditions until normal Dissolved Oxygen levels are restored.

## 5. UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

5.01 Those adverse effects which cannot be avoided in the execution of the construction and operation activities include:

a. Survey and Inspection Operations

1. A short-term low-magnitude inconvenience to a few recreational boaters who must avoid the work areas in the waterway.
2. Short-term, low-magnitude adverse impacts on local natural environmental quality caused by the release of small amount of oil and lead from the project vessels into the harbor waters and gaseous pollutants and noise into the atmosphere.

b. Dredging Operations

1. Minor short-term inconveniences of low-magnitude caused by dredging vessels to a small number of recreational boaters who must avoid the local work area.

2. Short-term low-magnitude increases in pollutant levels caused by motors used to power the dredge, releasing small amounts of noise and gaseous pollutants into the atmosphere.

3. Continued cyclical disruption of benthic and planktonic communities as well as the displacement of nektonic organisms during construction and future maintenance.

4. Short-term, medium magnitude adverse impacts due to increases in turbidity, COD, solids, heavy metals, and nutrient levels, and decreases in Dissolved Oxygen levels in the water column and in the downstream direction.

5. Possible temporary emigration of fish from work areas until such time as water quality improves and turbidity decreases, possibly resulting in temporary reduction in recreational fishing potential. May occur only in immediate vicinity of dredge.

6. Continued prevention of the re-establishment of a mature benthic community regardless of improvements in the quality of the sediment, caused by the proposed operation and future maintenance.

c. Transport of Dredged Materials

1. Short-term, low-magnitude adverse impacts on local air quality caused by the engines of the dredge. The engine will emit minor amounts of noise and gaseous pollutants into the atmosphere. Transfer site machinery would also be a source of atmospheric contaminants.

2. Minor short-term inconvenience caused by the dredge and transfer facilities to a small number of recreational navigators who

must avoid the area.

3. Minor short-term inconveniences caused by the hauling of the dredge material via truck along residential roads.

d. Disposal Operations

1. Disruption of approximately 10 acres of biologically productive upland. Some organisms may be able to burrow up through the freshly deposited dredge materials, but the remainder will be lost beneath the deposited materials or will leave the area when activities begin.

2. Quantitative data on vegetative uptake of heavy metals from dredged material is very limited. Thus, appropriate application rates for dredged material on the disposal site are best derived from data available for municipal wastewater treatment sludge. (24) The total amount of sludge metals recommended for application to agricultural land and the total amount of these metals in the dredged material which will be placed on the disposal site are shown in Table V-1. Since the disposal site has an area of 8.6 acres, Table V-1 shows that the loading rate for dredged material at the disposal site would be below the recommended level for application of sludge metals to agricultural land and would serve to mitigate the impacts of vegetative uptake. Since the metal loading rate for the disposal site would be acceptable for agricultural lands producing crops for direct and indirect human consumption, heavy metal uptake by wildlife utilizing the disposal site will not pose a threat to either wildlife or human health.

3. Leaching of heavy metals from the disposal site into groundwater is also a potentially significant environmental effect. However, elutriate test results (Appendix A) indicate that heavy metals in Crooked River sediments are not readily released. In addition, there are substantial clay strata between the disposal site and underlying potable groundwater resources (at least 150 feet below the surface). These clay strata will adsorb or complex heavy metals, further minimizing the possibility that heavy metals leached from the dredged material will reach the productive groundwater aquifer. Thus, the quantity of heavy metals reaching the potable groundwater will not result in a significant impact.

4. Boring logs (see Appendix C) indicate the presence of saturated soils approximately 6 feet below the surface. Since these soils are thought to be in hydraulic contact with the neighboring lakes and rivers, metals which reach these soils could potentially contaminate surface waters. The drop in surface elevation between the proposed site and neighboring surface waters (Maple River) is approximately 20 feet, and the distance is about 2000 feet. Thus, the hydraulic gradient is 0.007 feet/feet.

Table V-1

METAL APPLICATION GUIDELINES  
AND DISPOSAL SITE LOADINGS

Metal	Total Amount of Sludge Metals Allowed on Agricultural Land* (lb/acre)	Total Amount in 19,500 cu yds of Crooked River Sediments** (lb)
Pb	500	710
Zn	250	835
Cu	125	906
Ni	50	284
Cd	5	32
Ba	NA	1,008

\* Soil Cation exchange capacity of 0 to 5 meq/100 g (typical of sandy soils) determined by the pH7 ammonium acetate procedure. Knezek, B.D. and R.H. Miller, eds., "Application of Sludges and Wastewaters on Agricultural Land: A Planning and Education Guide", Ohio Agricultural Research and Development Center Research Bulletin 1090, Wooster, Ohio, October 1976.

\*\* Assumes wet weight density of dredge material to be 1 ton/cu yd. U.S. Environmental Protection Agency, Region V, "Report on the Degree of Pollution of Bottom Sediments, Inland Route, Michigan". October, 1975.

5. Particle size analysis of the saturated soils from the 5.5 to 11.5 foot stratum at the disposal site show that on the average ten percent of the soil ( $D_{10}$ ) is finer than 0.12 mm. Using Hazen's equation ( $k = CD_{10}$  where C is equal to approximately 100 cm/sec in coarse soils), the coefficient of permeability ( $k$ ) is calculated to be approximately 2.2 in/hr. Combining the permeability and the hydraulic gradient using Darcy's law, it is evident that about 175 years would be required for shallow subsurface water to migrate from the disposal site to the closest surface water. During this time and over the 2000 feet of travel required, natural soil attenuation process would act to prevent any significant concentration of metals from reaching surface waters.

6. Nitrate ( $\text{NO}_3^-$ ) is also a potentially significant source of groundwater contamination. In inorganic sediments, most of the nitrogen is in the form of ammonium ( $\text{NH}_4^+$ ) while organic nitrogen is the predominant form of nitrogen in organically enriched sediments. (22) Sediments from Crooked River contain on the average 0.44 percent total nitrogen, essentially all of which is in the organic form. At 0.44 percent, 9,500 cubic yards of backlog Crooked River sediments contain approximately 34,000 pounds of organic nitrogen.

7. The rate of organic nitrogen mineralization to nitrate depends on a variety of conditions including water content, aeration, pH, and temperature. Precise mineralization rates for various soil types and climates are not well established, but available data indicate that from 15 to 35 percent of the organic nitrogen in sludge is mineralized the first year following application. (25-29) Smaller percentages of the remaining organic nitrogen is mineralized in subsequent years. For example, 15 percent mineralization in sandy loam soil the first year, 6 percent the second year, 4 percent the third year and 2 percent thereafter, has been suggested for sewage sludge. (27)

8. The probably primary source of organic nitrogen in Crooked River sediment is forest litter from the water shed. Since this organic material will decompose at a significantly slower rate than wastewater treatment sludge, the rate of mineralization of organic nitrogen in the Crooked River sediment is conservatively estimated to be approximately 10 percent (3,400 pounds) in the first year.

9. Uptake of mineralized nitrogen by grasses planted on the disposal site should approximate 200 pounds per acre per year. Guidelines for application of sewage sludge to agricultural croplands

specify a maximum application rate based on nitrogen content of two times the annual crop uptake of nitrogen; in this case, 400 pounds per acre per year. Thus, a disposal site of approximately 8 acres is required to insure that the application rate of dredged material does not exceed sewage sludge guidelines (the best available basis for impact assessment).

10. As discussed, potential impacts related to organic nitrogen mineralization and subsequent leaching of nitrate into the groundwater are minimized primarily through utilization of an appropriate dredged material application rate. In addition, productive groundwater resources in the area at least 150 feet below the land surface, and neighboring surface waters in contact with shallow groundwater are at least 2000 feet from the site. Thus, soil attenuation will also serve to minimize the probability of surface or groundwater contamination by nitrate leached from the disposal site.

11. If ponding should occur within the diked inclosure during dredging operations, it could become a breeding site for mosquitoes. This nuisance is not expected to be a problem due to the short duration that water will be allowed to stand and become stagnant.

#### Transfer Site

12. Probably unavoidable adverse environmental effects associated with construction and operation of the transfer site include (1) destruction of benthic habitat; and (2) temporary degradation of air; and (3) water quality. As discussed below, none of the effects will be significant.

13. Approximately 1000 square yards of benthic habitat would be altered as a result of dredging adjacent to the transfer site to provide access for dredging equipment. This will not result in a significant impact since any unique features have already been altered by previous maintenance dredging of the area. Although dredging will remove existing benthic organisms, the sediments remaining will provide suitable habitat, which will be repopulated by immigration from adjacent undisturbed areas.

14. Transfer site dredging activities and installation of mooring piles will temporarily generate undesirable turbidity in the Crooked River immediately adjacent to the transfer site. However, turbidity will dissipate following completion of construction activities. Spills of dredged material during transfer operations will also generate turbidity, but operational procedures are designed to minimize spills. The projected impacts as related to applicable Michigan water quality standards are summarized in Table V-2.

TABLE V-2  
PROJECTED PROJECT IMPACTS ON WATER QUALITY

Parameter	Michigan Standard*	Anticipated Impacts	
		Transfer Site	Continued Disposal Site
pH	6.7-8.5	no change	no change
Fecal Coliform	Shall not exceed more than 200 counts/100 ml for total body contact	no change	no change
Dissolved Oxygen (D.O.)	6	**	no change
Temperature	No more than a 30 F. use above existing natural water temp. at the mixing zone	no change	no change
Dissolved Solids	500 for a monthly ave. or 750 at any one time	no change	no change
Chlorides	50 for a monthly ave.	no change	no change

a) Rule 1092 "Water quality standards shall not apply to dredging or construction activities by the U.S. Army Corps of Engineers or this Department." The Corps will implement all practical steps to meet the state standards.

\* All values except pH in milligrams per liter (mg/l).

\*\* During transfer site construction operations, the D.O. level may drop below the allowable state limit. This is a temporary condition and oxygen levels will return to ambient levels shortly after transfer site access dredging is completed.

15. Air quality will be adversely affected in the immediate vicinity of the transfer site as a result of exhausts from construction and operating equipment. As described above for the proposed disposal site, ambient air quality is excellent and air quality criteria will not be exceeded as a result of the proposed transfer site.

16. Noise problems are complex and effects depend on distance, wind, weather, and the particular listener. Impacts are expected to be of a low nature due to the light residential use of surrounding areas.

17. Odors from sediments in Inland Route are described by EPA as septic. The odors tend to disappear or disperse upon exposure of sediments to air. Consequently, this is a short-term adverse effect. The tree-fringe would separate the facility from adjacent residential areas. The trees would act as a filter.

18. Operation of the facility may produce accidental spills of dredge material into the water.

## VI. ALTERNATIVES TO THE PROPOSED ACTION

6.01 The proposed action involves the periodic maintenance and backlog dredging of Michigan's Inland Route, by the United States Army Corps of Engineers as authorized by Congress. Maintenance dredging includes the removal of the shoaling sediments and disposal of dredged materials. This project also includes the operation, maintenance, and proposed public use facilities of the Alanson Lock and Weir. The intent of the Water Resource Council's 'Principals and Standards' was considered throughout the plan formulation stage of this project. As a result of interagency coordination and tradeoff analysis of various dredging and disposal methods that resulted, the proposed plan was selected.

6.02 Alternatives to the proposed disposal methods area: (A) disposal of sediments to open water; (B) confined disposal; (C) pre-treatment of materials; and (D) no action. In terms of economic engineering feasibility, irretrievable resources, and minimal ecological disruption, the process of confined disposal for sediments unsuitable for open water release offers the best alternative at the present time. The ultimate solution depends on adequate control of upland erosion with the resultant soil runoff and reductions in contaminants from municipal, commercial, and industrial discharges.

### A. Open Water Disposal

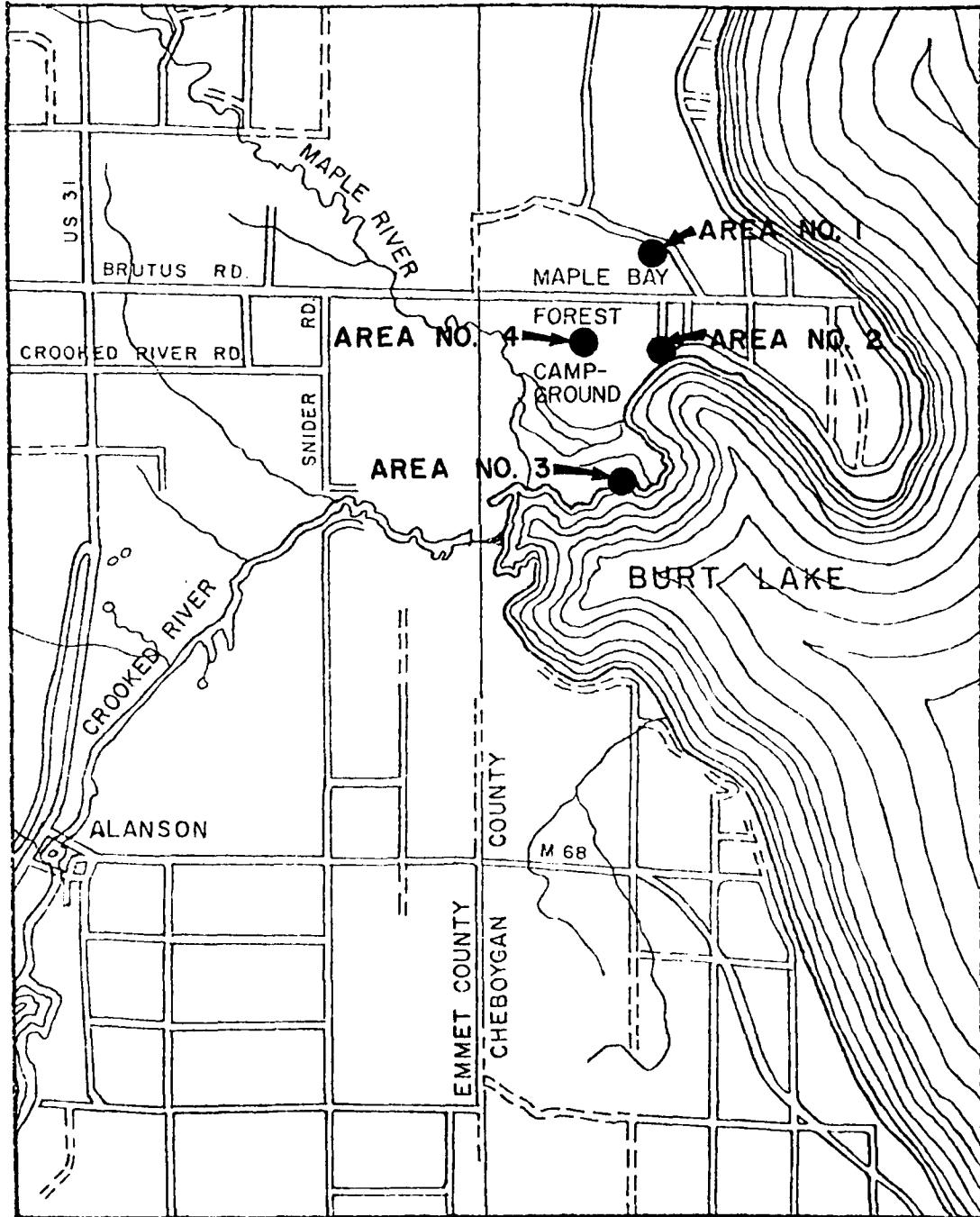
6.03 Maintenance dredging of the Inland Route, including the Crooked River, was authorized by Congress in 1954. Sampling of the Crooked River between Crooked Lake and Burt Lake by the EPA (Region V) determined that the sediments in the river are unsuitable for open lake disposal (See Appendix A). Confinement of any unsuitable dredged material has been specifically requested by the Governor of Michigan (1970) and is authorized by the River and Harbor Act of 1970 (Public Law 91-611). Thus, confined disposal of dredged material from the Crooked River is the only acceptable method of disposal.

### B. Alternative Diked Disposal Sites

6.04 Five principle alternatives to the proposed transfer and disposal facilities on Snider Road were considered (see Figure VI-1):

- Area Number 1 - Burt Township Dump
- Area Number 2 - 4 to 5 acres adjacent to the Maple Bay Forest Campground
- Area Number 3 - Approximately 2 acres at the mouth of the Maple River
- Area Number 4 - Borrow pit near Maple Bay Forest Campground
- No confined disposal

FIGURE VI-1  
ALTERNATIVES TO THE PROPOSED DISPOSAL FACILITIES



In addition to the discussion provided below, a chronology of events leading to selection of the proposed site is included in Section IX. Area Number 1 would involve disposal of dredged material at the Burt Township Dump, which is located approximately 2 miles north of Maple Bay. This disposal site occupies an area of approximately 12 acres on isolated lowlands. The site was previously operated as a dump for municipal refuse. In order to protect against environmental degradation and health hazards and to comply with Michigan solid waste regulations, refuse at the dump was covered over and the site was final graded in 1975. Two roll-off trash containers are now located at the dump site for use by township residents for solid waste disposal. A contract hauler periodically removes the containers for disposal at a regional landfill. Although the site is now operated strictly as a transfer facility, dredged material could be accommodated.

6.05 Disposal of dredged material at Area Number 1 would require that it be transported by truck from a shoreline transfer facility. The most feasible location for the transfer facility would be the boat launching facility at the Maple Bay Forest Campground. Dredged material would be transported from the Crooked River in a hopper scow to the boat launching ramp, where it would then be loaded into trucks and hauled to the dump site. To facilitate transfer operations at the boat launching facility, it would be necessary to construct a pier in Maple Bay. However, local residents opposed construction of such a pier.

6.06 Alternative disposal Area Number 2 would involve extending the western boundary of Maple Bay Forest Campground located on the shoreline of Maple Bay. The immediate area is characterized by a low lying coastal zone, submerged until approximately 1 June, with wet areas found intermittently throughout the year. Submerged areas occur with greater frequency to the south and west in the direction of the Maple River.

6.07 The existing campground from 100 feet inland to the shoreline is located on a previously filled area. There are currently 36 camp sites, with an average density of between three and four campsites per acre. Michigan Health Department regulations restrict the Campground to a maximum of 50 camp sites. Alternative Number 2 would involve filling 4 or 5 acres of wetlands adjacent to the existing campground in order to create 14 additional camp sites. Use of Area Number 2 would also involve construction of a pier in Maple Bay to facilitate unloading of dredged material from hopper scows used to haul it from the Crooked River. Local residents opposed the construction of a pier in Maple Bay. In addition, the EPA and FWLS opposed the use of this site because it involved filling the wetlands and destruction of the associated biological habitat.

6.08 A third alternative considered (Area Number 3) was the disposal of dredged material in a low lying area near the mouth of the Maple River. This site is owned by the Michigan DNR and has physical characteristics and vegetation similar to those of Area Number 2. In addition, this site is accessible only by water. Utilization of this site would require the construction of a horseshoe shaped dike back from the shoreline. Excavation of an access channel would also be

required. Existing trees on the shoreline would be retained to screen the disposal area. The EPA and FWLS opposed this site for the same reasons as Area Number 2.

6.09 A fourth disposal alternative considered (Area Number 4) involved placing the dredged material in a borrow pit on Michigan DNR property approximately 1/2 mile west-northwest of the Maple Bay Forest Campground. EPA and local residents agreed that this site was acceptable for dredged material disposal. In a letter dated February 23, 1977 (see page D-3), the U.S. Fish and Wildlife Service stated that the MDNR borrow pit south of Brutus Road, corresponding with site 4 in the statement, would not be approved until after a field investigation could be made. To date, no such survey has been completed. However, since the site was inland, a transfer facility would have to be constructed for unloading the hopper scows and placing the dredged material in trucks for transport to the site. The only practical location for such a facility was Area Number 1. As discussed above, local residents opposed the construction of a pier in Maple Bay for the purpose of dredged material transfer.

#### C. Pretreatment

6.10 Treatment of dredge material could be accomplished in several ways; (1) local sewage treatment works; (2) separate onshore treatment plants; and (3) on-board treatment prior to in-lake discharge.

6.11 Assume the removal of a moderate amount of dredgings; i.e., 1,000 cubic yards of material per day. A 0.5 percent slurry of that amount would be a volume equivalent to the wastewater discharge of 0.25 million people. Existing sewage treatment plants do not have the capacity to treat these additional volumes. Costs for new treatment plants are prohibitive, and chemical treatment to settle the suspended solids is expensive. In addition, chemical flocculation in conjunction with open lake disposal could cover lake bottoms with sediments unsuitable for biological production.

#### D. No Action Alternative

6.12 A no action alternative was also considered. Under the provisions of Public Law 91-611 no dredging will be done without an acceptable disposal site. Continuous shoaling of the channel will continue to impede the movement of recreational craft and limit access between the lakes on the Inland Route. A workshop held to discuss the various disposal alternatives indicated that local residents want safe navigation in the Inland Route to be maintained. If dredging is not conducted, the environmental impact of dredging and disposal associated with the other alternatives would be absent. Local businesses that depend on recreational boating activities would suffer.

6.13 The alternative for structural maintenance of the Alanson lock and weir, that is the most realistic, is also "No Action". This alternative would result in the continued deterioration of the struc-

tures until they would no longer be serviceable. Recreational use of the waterway and water level regulation in the upstream project area would be impaired.

6.14 There are two alternatives to the proposed public use facilities - "No Action" and "Partial Implementation". The former alternative would prevent the impacts associated with the proposed structural improvements from occurring. Economic savings would be made, and construction activities would not adversely impact present use, recreation, and surrounding environment. Negative impacts associated with this alternative would be (1) lack of storage facilities for lock maintenance equipment; and (2) lack of restrooms, sightseeing accommodations, and adequate parking for tourists visiting the existing facilities. "Partial Implementation" of the proposed action would allow some improvements of the existing facilities but would reduce those actions considered detrimental to the environment. This could exclude the parking lot, walkway and woodchip trail and would remove major benefits from the project. Consequently, this alternative was considered infeasible.

VII. RELATIONSHIP BETWEEN SHORT-TERM USE OF MAN'S ENVIRONMENT  
AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

A. Short-Term

7.01 The major short-term benefit associated with the proposed project would be the maintenance of the recreational boating channel in the Crooked River. The removal of shoaling would permit safer navigation through the channel. As a result, recreational boaters and associated economic interests would benefit.

7.02 A temporary loss of wildlife habitat and increased noise and air pollution levels would be the major short-term adverse impacts associated with construction of the transfer and disposal facilities and hauling of the dredged material to the disposal site. White-tailed deer presently utilize the disposal site as a yarding area, and songbirds feed on the wild berries. Use of the site for these activities will be precluded during construction and operation.

7.03 Initial construction and use of the site during backlog dredging operations is anticipated to last approximately 6 months. Following disposal of backlog dredged material, the site could be seeded with grasses and again be suitable as wildlife habitat. Use of the site for dredged material disposal may delay the natural reforestation process. However, site investigations indicate that natural re-vegetation processes in this area are slow due to the relatively low fertility of the soils. Addition of the dredged material to the site would improve the ability of the soils to support vegetation, and may actually increase the rate of revegetation.

7.04 The major short-term effect of the proposed maintenance and operations of the lock and weir structures is that the lock would continue to be navigable for recreational craft. This continued navigability would help to avoid economic burdens to businesses and citizens alike. Residents and tourists derive social, educational, economic, and aesthetic values from continued operations and maintenance of the Federal facilities.

7.05 The Inland Route was always navigable, although snags and sand bars on the rivers created obstacles that required portages at times. Negative effects are minor in scope. Small quantities of nonrenewable resources are consumed during lock operations and maintenance.

7.06 The lockage facility assists in navigation. The additional vessel traffic on the waterways attributed to the lock may temporarily disrupt the wildlife of the waterway during the busy summer months. Mature fish migrate through the lock and weir during their migration runs. The effect of lock operation and maintenance on larval fish is unknown.

7.07 A temporary disruption of wildlife and increased noise, air and water quality degradation would be a short-term adverse effect of the proposed construction of the public use facilities.

7.08 The proposed construction would help to alleviate the congestion of people and motor vehicles that is exhibited at the site during peak tourist times. The proposed facilities would benefit public use and provide for the public's involvement in this Federal facility.

B. Long-Term

7.09 The significant long-term benefits associated with dredged material placement at the disposal site would be the increased soil fertility and improved wildlife habitat at the site, and the recreational and economic benefits associated with continued safe use of the Crooked River by recreational boaters. The high organic content of the dredged material to be removed from the Crooked River makes open water disposal unacceptable. However, this characteristic benefits the disposal site since additional nutrients will be made available for vegetation. Vegetation on the site following construction and disposal operations will provide improved feeding for wildlife, especially grouse and deer.

7.10 A potential adverse long-term effect of the disposal site would be the accumulation of heavy metals by game animals, and subsequent introduction into the human food chain. As discussed in detail in Section IV, the disposal site is designed to insure that application of heavy metals in the dredged material does not exceed the recommended maximum metal accumulation in agricultural land used for municipal wastewater treatment sludge disposal. In this way, long-term productivity of the site would be maintained and heavy metal accumulation in wildlife would be sufficiently small that wildlife and human health are not endangered. However, the site may be only one of several pathways of heavy metal uptake by wildlife accumulation of heavy metals.

7.11 As discussed in Section V, the site is designed to insure that mineralization of organic nitrogen in the dredged material and subsequent leaching of nitrate from the disposal site would not adversely affect groundwater quality. However, use of the site for dredged material may limit placement of other high nitrogen content materials on the site for approximately three years following completion of disposal activities.

7.12 The long-term effects of the improved and continued operation of the lock and weir would be the enhanced convenience for visitors viewing the lock operation, as well as for the overall operation of the lock facilities. Shoreline residents also receive flood control benefits from the water level regulation in the upper river channels and lakes.

VIII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES  
WHICH WOULD BE INVOLVED IF THE PROPOSED ACTION SHOULD BE  
IMPLEMENTED

8.01 The labor, materials, and fuel committed for dredging, dredged material disposal, and the operations, maintenance, and proposed improvements to the lock and weir for the Inland Route would not be retrievable and may be considered as commitments of resources for present and future generations.

8.02 The labor, materials, and fuel committed for dredged material disposal operations for the Inland Route would not be retrievable and may be considered as commitments of resources for present and future generations.

8.03 Placement of dredged material on the disposal site would eliminate existing vegetation. However, the site could be re-vegetated after each stage of disposal operations. In addition, the types of vegetation present on the disposal site are common in the area and their elimination would not represent a significant commitment of resources for present and future generations.

8.04 The land disposal of dredged material is an irreversible and irretrievable use since drying and aerobic decomposition of the organic fraction will permanently alter the composition of this material. However, sediment is not in short supply and represents no major natural resource in its present form.

8.05 The composition of the material deposited in the disposal site dictates the eventual use of the area. The dredged material contains unsuitable levels of heavy metals. Thus, vegetative uptake and subsequent concentration of these heavy metals in the food chain must be considered. Elutriate tests conducted by the EPA Region V indicate that the heavy metals present in the dredged material are not readily released. In addition, the grasses which will be used to seed the site following the dredged material disposal are relatively resistant to bioaccumulation of heavy metals. Thus, wildlife utilization of the site following disposal operations is acceptable, and no irreversible commitment or use of the site is involved. Furthermore, the organic content and smaller particle size distribution of the dredged material relative to the native soils at the site could increase the productivity potential of the site, and thus, the feasible alternative future uses of the site.

## IX. COORDINATION, COMMENT, RESPONSE

9.01 In 1974, the Corps contacted Littlefield and Burt Townships, Cheboygan and Emmet Counties, the City of Petoskey and the Michigan Health Department (District Number 3) to discuss alternative sites for the construction of a confined disposal facility to contain polluted dredged material from the Crooked River. To further discuss the selection of sites for the proposed disposal facility, representatives of the Corps attended a Burt Township board meeting on 5 December 1974. At this time four possible disposal sites were discussed (See plate VI-1):

- . A 2 acre site adjacent to Burt Lake and close to the mouth of the Crooked River (Area 3)
- . A site approximately 200 feet from the Burt Lake shoreline adjacent to the site below (Area 4)
- . The park located at Maple Bay on the shoreline at Burt Lake (Area 2)
- . The Burt Township Dump (Area 1)

9.02 In early 1975, action on site selection was delayed pending the results of additional sediment sampling by EPA Region V. In late 1975, EPA Region V reported that sampling conducted on 29 October 1975, confirmed earlier sediment sampling conducted in 1968 and 1970 and indicated that the sediments of the Crooked River are unsuitable for open lake disposal (see Appendix A for details).

9.03 In September 1976, the DNR Dredged Material Site Selection Committee conducted field investigations on alternative disposal Area Numbers 1, 2 and 3 as described in Section VI. It was decided that Area Number 1 would be acceptable if a suitable interim site could be located. Suitability of Area Numbers 2 and 3 was taken under consideration by the committee members.

9.04 On 26 October 1976, the FWLS informed the Corps that they opposed the use of areas of mixed deciduous and evergreen wooded swamps as temporary holding sites or permanent disposal sites. In a letter dated 7 December 1976, the FWLS restated their opposition to the use of wetland sites.

9.05 On 8 December 1976, a public workshop meeting was held at the Indian Lake School at Indian River, Michigan to discuss alternative disposal sites for dredged material from the Crooked River. Alternative disposal Area Numbers 1, 2, and 3 as presented in Section VI were discussed in detail. From the workshop it was learned that local residents were opposed to any alternatives which involved increased use of the campground area, including construction of a pier in Burt Lake. As a result, alternative disposal Area Number 4 and the proposed disposal area were suggested as additional alternatives.

9.06 On 9 December 1976, alternative disposal Area Number 4 and the proposed area were visited by DNR, Corps and FWLS representatives. It was concluded that both sites were feasible from an engineering standpoint.

9.07 On 23 February 1977, the FWLS indicated approval of the proposed disposal and transfer sites, as well as Area Number 1. Similarly, on 11 March 1977 the EPA Region V approved of the proposed transfer site and final disposal facility.

9.08 Based on EPA and FWLS approval, in conjunction with local resident opposition to the construction in the neighborhood of the Maple Bay Forest Campground, the proposed disposal and transfer sites were selected.

9.09 This project is reviewed for compliance with the following laws: the Fish and Wildlife Act of 1956, Fish and Wildlife Coordination Act of 1958; National Historic Preservation Act of 1966; National Environmental Policy Act of 1969; Federal Water Pollution Control Act of 1972; Endangered Species Act of 1973; Water Resources Development Act of 1976; Water Quality Act of 1977; Executive Order 11990, Wetlands Protection, May 1977; as well as the Congressional actions authorizing construction and maintenance of the Federal navigation channels.

9.10 In accordance with the Endangered Species Act of 1978, Section 7 consultation has taken place with the Regional Office of the U.S. Fish and Wildlife with respect to the possible presence of a bald eagle nest near a proposed dredging location. If the presence of the nest is verified, dredging in the area would be suspended between 1 February and 31 July as recommended (See USF&WS letter, Appendix E, page 26).

9.11 Government Agencies. The following governmental agencies have been contacted in coordinating the Final Environmental Statement.

1. U.S. Environmental Protection Agency
2. U.S. Fish and Wildlife Service
3. Michigan Department of State
4. Michigan Department of Natural Resources

9.12 Environmental Review. In addition to the above coordination, timely distribution of this document was made to all appropriate government agencies, interested groups, and individuals.

9.13 Comments and Responses: This section will be reserved in the Final Environmental Statement to address comments and suggestions submitted by interested agencies, groups, and citizens in response to this Draft Environmental Statement.

9.14 Environmental Review. In addition to the above coordination, timely distribution of the final report was made to the following government agencies, interested groups, and individuals:

Federal Agencies

Advisory Council on Historic Preservation  
U.S. Department of the Interior  
U.S. Department of Commerce  
U.S. Department of Agriculture  
U.S. Department of Transportation  
U.S. Department of Health, Education, and Welfare  
Federal Power Commission

State Agencies

Michigan Department of State Highways and Transportation  
Michigan Department of State - Michigan History Division  
Michigan Department of Agriculture  
Michigan State University - Conference of Michigan Archaeology  
Michigan Department of Commerce

Local Agencies

Emmet County  
Cheboygan County  
N.W. Michigan-Regional Planning and Development Commission  
Local Township Supervisors

Environmental - Civic Groups

Michigan United Conservation Clubs  
Historical Society of Michigan  
National Audubon Society  
Izaak Walton League  
Sierra Club  
Michigan Student Environmental Conference  
Michigan Audubon Society  
Michigan Natural Areas Council

Individual Citizens

9.15 Copies are available to interested individuals upon request from U.S. Army Engineer District, Detroit, P.O. Box 1027, Detroit, Michigan 48231, Attn: Environmental Resources Branch.

9.16 Comments on the Draft Environmental Statement and responses to them are listed in the following section. Copies of the original correspondence are included in Appendix E.

COMMENTS AND RESPONSES

FEDERAL AGENCIES

Department of Health, Education, and Welfare

Public Health Service

1. Comment: Mosquito problems are not mentioned as a possible result of the dredged material disposal. However, dredged material disposal sites are recognized as sources of Aedes sollicitans and other salt marsh species along the Gulf and Atlantic coasts, and complicate mosquito control efforts in those regions.

Response: Please refer to the response for Comment 2 below.

2. Comment: Since we are presently unsure of the contribution of spoils disposal sites in Michigan (or other north central areas) to vector mosquito problems, it would seem appropriate that the Michigan State Department of Health be contacted in this regard.

Thank you for the opportunity to review this statement.

Response: Alvin A. Therrien, Chief of the Insect and Rodent Control Section of the Michigan Department of Public Health, was contacted. Mr. Therrien indicated that he would not expect any significant increased vector activities in the project area, in particular with respect to the mosquito species Aedes sollicitans, as a result of the proposed project. Mr. Therrien also added that his section would monitor the subject site and provide recommendations for an abatement program should a problem arise.

Federal Energy Regulatory Commission

1. Comment: Comments of this office are made in accordance with the National Environmental Policy Act of 1969 and the August 1, 1973 Guidelines of the Council on Environmental Quality. Our principal concern with developments affecting land and water resources is the possible effect of such developments on bulk electric power facilities including potential hydroelectric developments and on natural gas pipeline facilities.

Since the proposed project apparently would pose no major obstacle to the construction and operation of such facilities, we have no comments on the Draft Environmental Statement.

Thank you for the opportunity to comment on the Draft Environmental Statement.

Response: Thank you for your review and comment, you will be kept informed of any future developments.

U.S. Department of Agriculture

Soil Conservation Service

1. Comment: We have reviewed the draft environmental statement and letter report concerning the maintenance dredging and confined disposal facility for Michigan's inland route operation and maintenance and proposed facilities for the Alanson Lock and Weir. We have no comments to make.

Response: Your review of the subject DEIS is appreciated and noted.

U.S. Department of Agriculture

Forest Service

1. Comment: To minimize the bare appearance of the disposal site a few trees could be retained, or planted at the borders of the dredge disposal site; and, at the completion of disposal, trees should be planted on the spoil.

Thank you for the opportunity to review this Statement.

Response: The Michigan Department of Natural Resources is the local sponsor of the proposed disposal site. The DNR's planned future use for the site is wildlife management. As part of this plan, the DNR proposes to clear five acre stands of timber in the area and seed the clearings with grass for use by grouse and deer. The proposed landscaping for the disposal site is in accordance with the DNR management plan.

U.S. Department of Commerce

Assistant Secretary for Science and Technology

1. Comment: This is in reference to your draft environmental impact statement and letter report entitled "Maintenance Dredging and Confined Disposal Facility for Michigan's Inland Route and the Operation, Maintenance, and Proposed Public Use Facilities for the Alanson Lock and Weir, Michigan". The enclosed comments from the National Oceanic and Atmospheric Administration are forwarded for your consideration.

Thank you for giving us an opportunity to provide these comments, which we hope will be of assistance to you. We would appreciate receiving eight copies of the final statement.

Response: Eight copies of the FEIS will be forwarded as requested.

Great Lakes Environmental Research Laboratory

1. Comment: There are no objections to maintenance dredging in the Crooked River of Inland Route and disposal of polluted spoil in a confined area on land of Hardwood State Forest. Dredging in Crooked River and maintenance of Alanson Lock and Weir will have significant effect on the adjoining lakes Crooked and Burt.

It appears that disposal of any dredge spoil, polluted or clean, should not be considered in smaller inland lakes.

Response: Thank you for your review and comments.

National Ocean Survey

1. Comment: Although NOS maintains water level monitoring gages in the Great Lakes System, it does not in Michigan's Inland Route. Therefore, we are unable to support or refute specific values. However, in reviewing the statement, we find no objection to the proposed maintenance dredging, disposal facility, and operation of the Alanson Lock

Response: Your review is appreciated and noted.

U.S. Department of the Interior

Office of the Secretary

1. Comment: We have reviewed the Draft Environmental Statement and Letter Report for Maintenance Dredging, Alanson Lock and Weir in Michigan, and are providing the following comments:

Measures such as silt screens should be considered during dredging to control the downstream migration of materials that contain toxic substances (EIS page I-12, section D).

Response: Silt screens have been found to be quite useful in containing suspended materials resulting from dredging in open water situations (lakes, bays, etc.). However, from studies conducted by the Corps' Waterways Experiment Station, it was found that silt screens were ineffective when used in a current. In addition, navigation of the Crooked River would be hindered, if not halted, during dredge operations. With the sediment being chiefly composed of sand and silt, and the low concentrations of harmful materials present, it is not expected that increased turbidity is going to cause significant long-term impacts downstream of the project.

2. Comment: The frequency, magnitude, and depth of flooding on Maple River within the project area should be considered. Such data would be helpful to evaluate any adverse effects of flooding on the structural integrity of the dredged-material disposal site.

Response: The material to be disposed of at the proposed disposal site would be applied in thin layers and tilled into the existing soil. An elaborate dike system is not needed to contain the dredge material because the disposal area itself currently forms a depressed area relative to the surrounding surface areas. Therefore, if flooding did occur, it is not expected that the structural integrity of the site would be affected. In addition, the Maple River is a small stream located approximately 2000 feet from the site and at an elevation 20 feet below the disposal area; flooding is not anticipated to be a problem.

3. Comment: The hydraulic gradient used in calculating the rate of movement of nitrates from the disposal area to the nearest surface water (EIS page V-4) should be included in the statement, or water-table contours should be shown. The statement should also include at least typical depths to water in the shallow unconfined zone and in the confined aquifer. One or more logs of wells in the project vicinity that tap the confined aquifer would aid in impact appraisal. At least a limited amount of periodic ground-water monitoring should be considered; if this is to be accomplished by a state or other government agency, this fact should be mentioned.

Response: The hydraulic gradient used is shown on page V-2, last sentence, to be 0.007 feet/feet. It is also stated in the same paragraph that saturated soils exist approximately 6 feet below the surface. Ground-water monitoring is not being considered at the present time because material application (metal application and spreading) rates for the disposal site are within EPA criteria for placement of waste treatment sludge on agricultural land.

4. Comment: We believe that a misunderstanding of the Fish and Wildlife Service's (FWS) position relative to one of the alternative disposal sites should be corrected. On page VI-4, paragraph 6.09, the EIS incorrectly states that FWS agreed to accept the Michigan Department of Natural Resources' (DNR) borrow pit site located one-half mile west-northwest of Maple Bay Forest Campground. In a letter dated February 23, 1977 (see page D-3), the Fish and Wildlife Service stated that the DNR borrow pit south of Brutus Road, corresponding with Site 4 in the statement would not be approved until after a field investigation could be made. The field investigation was not accomplished. Therefore, the Fish and Wildlife Service never approved this site.

Response: Thank you for your comment, please refer to paragraph 6.09 in this revised text for the corrected statement.

U.S. Department of Transportation

Federal Highway Administration

1. Comment: The draft environmental statement for maintenance dredging and confined disposal facility for Michigan's Inland Route and the operations, maintenance, and proposed public use facilities for the Alanson Lock and Weir, Michigan has been reviewed and we have no comments to offer on the statement.

Response: Thank you for your review.

## STATE AGENCIES

### Michigan Department of Natural Resources

1. Comment: The Department of Natural Resources has reviewed your proposed Maintenance Operations and Dredged Material Disposal for Alanson Lock and Weir and for the Inland Route, and have the following comments for your attention.

Concern has been expressed regarding the disposal procedures for sediments acceptable for "open water" disposal. Presently, these sediments are placed on waterfront lands or dumped in open water. Do waterfront lands include wetland areas or lands below the ordinary high water mark? What actions are taken to prevent erosion of deposited material and the leaching of plant nutrients back into the water system? Does "open water" disposal include inland lake waters? These questions should be addressed in the environmental statement.

Response: This environmental statement, in part, discusses the maintenance dredging and confined disposal of sediments removed from the Crooked River portion of the Inland Route waterway. Confinement is necessary because the sediments in this part of the navigation course have been classified as unsuitable for open water disposal. Past practice was to dispose of the material along shoreline areas that needed restoration or provided the least environmental damage as compared to disposal on the bottomlands of an inland lake. It is against Corps' policy to fill wetlands, except if there are no other practicable or viable alternatives and that it is judged to be in the best public interest. These concerns and the other environmental implications of the dredging and disposal of material from those areas of the waterway defined as suitable for open water disposal would be addressed prior to project initiation and only after the most recent and up-to-date information has been obtained. This dredging is not expected to occur until 1980-81, which would provide sufficient time for changes.

2. Comment: The report identifies soil stabilization for the finished product but says nothing about preventative measures that will be followed during construction. This should be established when a permit is obtained from the Emmet County Zoning Agency.

Response: It is expected that the proposed project would be administered by contract. The Contractor shall without additional expense to the Government, be responsible for obtaining any necessary licenses and permits, and for complying with any applicable Federal, State, and municipal laws, codes, and regulations, in connection with the prosecution of the work. All project areas would be maintained in

a manner so as to provide adequate protection for the site as well as the surrounding areas.

3. Comment: In reference to Section IV, page 5, paragraph 4.22, sentence 5, fish perhaps do not instinctively avoid high turbid or low DO areas. Movements may depend on size of fish, species of fish, or whether entrapment occurs, i.e., if the fish is caught in a situation from which he has no escape route. Evidence is available to show that certain fish penetrate areas of turbidity and low DO, indicating that the avoidance instinct is questionable.

This may become a problem due to the effects of the high concentrations of COD (150,000 mg/kg dry weight, average) on the areas downstream from the dredging operation. Calculations indicate that moderately high oxygen demand will result in this system from the COD dredged from the sediments. Should these values exceed 5 mg/kg, dissolved oxygen in the system will be severely reduced below the dredging operation which could result in fish kills.

It is, therefore, recommended that the Corps establish a station upstream from the dredging operation as a control and a station within the next mile downstream from the dredging operation and monitor dissolved oxygen concentrations on a daily basis for at least the first 21 days of operation.

Response: The proposed activity would be monitored for dissolved oxygen levels.

Michigan Department of State Highways and Transportation

The Statement describes the impacts of the dredging operation in detail and is generally adequate in the description of impacts from the disposal of dredge materials. We concur with your selection of the transfer and disposal site. We do feel, however, that more detail is needed in the discussion of impacts associated with the public use facilities. We wish to offer the following comments:

1. Comment: An unnamed creek flows into the Crooked River in the vicinity of the transfer site. It has been designated as a trout stream by the Michigan Department of Natural Resources. No mention of it was made in the Statement. If the creek is far enough from the site to ensure that it will not be affected by construction activities, or the loading of dredge materials, then this should be stated. It appears, however, that because of the proximity of the creek to the transfer site, some impacts might occur during and after construction from loading activities. If this is the case, these impacts should be addressed in the Statement.

Response: The Michigan Department of Natural Resources, Fisheries Division was contacted by telephone. The MDNR District Biologist, for the Inland Route area, made a field inspection of the project area and concluded that the proposed activity would not adversely impact the creek nor any possible fishery associated with the creek. It was agreed that all possible caution would be taken to insure that the creek remains outside of project influence.

2. Comment: The potential for sedimentation into Crooked River is high during construction of the transfer site because of the fill material being placed on the river bank. Every effort should be taken to ensure that the fill material will not enter the river during construction.

Response: Placement of material for the construction of the transfer site would be done in a manner such that sedimentation and/or turbidity would be kept at a minimum level. Once site construction is completed, riprap would be used for protection.

3. Comment: Paragraph 4.36 on page IV-8 states that "the grove of cedar trees on which the proposed trail is to be placed is small, and impacts to ground, river, storm and flood waters, as a result of the proposed action should be minimal." Does this mean the entire grove will be removed, or just a portion of it? If the entire grove is to be removed, what is its size? Is the 900 square feet to be filled with woodchips the entire grove, or part of it? These points should be clarified.

Response: A field inspection of the proposed site showed that there would be adequate space for the placement of the woodchip trail without the loss of any trees. However, some trimming of branches could occur in order to provide for unobstructed passage along the trail. The trail

has been designed to fit as naturally as possible in relationship to its surroundings. This is why woodchips are being used as surfacing material and the trail route laid out to go around existing trees.

4. Comment: Part E of Section IV which described the impacts of construction of the Public Use Facilities does not describe the impacts from construction of the parking lot and storage building. How much vegetation will be removed, and how will this affect the terrestrial and aquatic environment? Will any fill material be required?

Response: The parking lot and storage building will be built on a site upon which fill material was placed during the construction of the lock in 1967. Since that time normal succession has revegetated the site with secondary plant growth of grasses, weeds, and woody brush. Impacts attributable to this type of development would mainly be associated with the increased public use that this project would promote. Please refer to paragraph 4.36 of this final report. As the material on the site is former fill and probably of poor structural strength, it may become necessary to use select fill to provide a structurally sound subbase for the parking lot.

Michigan State University

I have had the opportunity to review the Draft Environmental Statement titled Maintenance Dredging and Confined Disposal Facility for Michigan's Inland Route, and the Operation Maintenance and Proposed Public Use Facilities for the Alanson Lock and Weir, Michigan. This has been evaluated with respect to the archaeological impacts of the proposed actions, Section IIN, pages II-23-24.

1. Comment: Although you are correct in indicating that no adverse impacts to archaeological sites should result from the project, Section 2.61 contains several substantive errors. Among these are that five archaeological sites exist within a one mile radius of the Alanson Lock and Weir, but that the project area itself has been surface surveyed by Michigan State University and no surface indications of sites were noticed. In addition, three archaeological sites occur within a one mile radius of the transfer site and disposal site on the Crooked River. The transfer site possessed no surface indications of archaeological materials. In summary, eight archaeological sites could have been affected by the proposed actions. However, two of the three project areas have received surface reconnaissance, while the disposal site is in a low potential area based upon survey in similar environmental situations.

Response: Thank you for your comments. The suggested corrections have been made in this final report. Please refer to paragraph 2.60 of this text.

Cheboygan County Board of Commissioners

1. Comment: We the undersigned, as representatives of the Cheboygan County Commission indicated, do hereby register our formal protest against the location and construction of an off loading facility at the end of Snider Road - as contrasted to a more beneficial location of an off loading facility - that would provide for multiple purpose uses for years to come - and thereby return taxpayers a much greater value for their dollars.

We quote from a March 1, 1977, letter by Howard A. Tanner, D.N.R. Director, as follows:

"As Michigan's new law for erosion and sedimentation control continues to unfold, its value becomes more obvious. The number of cities, villages, and charter townships and 83 counties now participating in this local-state environmental preservation effort are proving that much can still be accomplished. No doubt, much damage to state waters has already taken place through thoughtless and careless urban and rural earth changing activities, yet protective progress can still be made. Michigan still provides some of the finest recreational waters in the country and accordingly must take great strides forward in protection. Act 347 of 1972 will serve to assist in reaching this goal."

Our proposal is that of constructing the off loading facility at the mouth of Maple River on the south end of the sand bar between Maple River and Forest Camp Ground.

This location for an off loading facility would result in its use for multiple purposes such as:

Sand sediment polluted from Maple River is slowly filling Maple Bay. The dredging of this sand sediment, to provide for dredge channels, could be used in the construction of the off loading facility. There would be an abundance of sand sediment to build up the sand bar for a truck road. Properly engineered, the banks of the truck road would provide a 2,000 ft. long public beach. In addition, an athletic field of fill and sediment would be a much welcomed and needed recreation facility to the Forest Camp Ground.

An expanded beach and athletic field to the south of Forest Camp Ground would bring much needed relief to the home owners adjacent to the Forest Camp Ground who currently share their beaches with the public.

One more very important use to be gained - Dredging at the mouth of the Maple River will keep the river open in both high and low water years so that fish spawning is not interrupted.

Our proposal to locate the off loading facility in the area of the mouth of the Maple River would not require relocation of a disposal facility other than the Snider Road location that has been selected.

AD-A106 934

CORPS OF ENGINEERS DETROIT MI DETROIT DISTRICT  
MAINTENANCE DREDGING & CONFINED DISPOSAL FACILITY FOR THE CROOK--ETC(U)  
JAN 80

F/8 13/2

NL

UNCLASSIFIED

R02  
200884

END  
DATE FILMED  
2-14-80  
DTIC

Briefly, our proposal recognizes:

- 1) Act 347 of 1972 and the need for a better environment through soil erosion and sedimentation control.
- 2) The responsibility of the Cheboygan County Parks and Recreation Commission to plan and act for the future. (The development of residential lake-shore property is making our job of providing public beaches very difficult. A 2,000 foot public beach would be most welcome.)
- 3) Not only safeguard the environment and plan for future recreation, but in so doing make certain that the taxpayer's money is invested wisely.

Response: Please refer to the response for Comment 2 below.

2. Comment: Motion by Commissioner Vincent, supported by Commissioner Hammer, that the Cheboygan County Board of Commissioners go on record in support of the proposed construction of an off loading facility at the mouth of Maple River on the south end of the sand bar between Maple River and Forest Camp Ground as proposed by the Cheboygan County Parks & Recreation Commission, the Cheboygan County Soil Conservation District and the Cheboygan County Drain Commissioner.

Carried unanimously.

Response: Your comments and suggestions have been addressed in a letter dated 17 July 1978. Please refer to Appendix D, page D-11.

Citizens

Laverne Underwood

1. Comment: In regard to your proposed transfer site for dredged material on the Inland Route, I have a few questions and gripes. I own the residence on the end of Snider Road and am a year round resident. Why weren't the ones so closely associated with this project notified of the meeting you had?

My main concern is I think the corner stakes on the river should be surveyed. Before the new roadbed was installed I knew where the corner stake was on my corner. The road south from Devil's Elbo Drive jogs West and is mostly on my property. I would like to see this area surveyed & moved in an easterly direction to give me more of a buffer zone. The odor, noise and congestion will be bad enough as it is. Also my lawn area is lower than the roadbed so feel will have a lot of spillage and mess on my area.

Also feel the county should be asked to clean & lower ditches on Devil's Elbo Drive where they connect with Snider Rd. before your project as it is standing stagnant water standing year round & very mosquito infested. If done after it will cause more soil to flow from creek into river & disrupt navigation.

Response: Your concerns have been addressed in a letter mailed from this office on 19 May 1978. Please refer to Appendix D, page D-13.

A discussion with the Emmet County Road Commission on 17 September 1979 confirmed that the ditches in question are scheduled for cleaning and lowering. This should eliminate the problems you have experienced with mosquito infestation. The erosion and sedimentation from ditch maintenance should not greatly affect navigation.

United States Environmental Protection Agency

1. Comment: The EIS indicated that water sources adjacent to the disposal site will be monitored to detect any detrimental impacts on water quality. A definitive monitoring program should be established before the project is begun stipulating who will be responsible for conducting the monitoring and reviewing the results, the frequency of monitoring, and what parameters will be tested. Both groundwater monitoring and monitoring in the vicinity of the transfer site should be included in the program. Parameters to be tested should include those which exceeded USEPA criteria for polluted sediment.

Response: The disposal area has been designed to provide containment of the dredge material and all precipitation which falls on the site, so that there would not be any runoff from the disposal area. A natural clay layer beneath the disposal site would provide a barrier between the site and the area's water bearing substrata. Contamination of area groundwater and surface water supplies is not expected to happen, therefore monitoring of area water sources is not necessary.

2. Comment: The specifics of disposal site runoff control should also be detailed in the Final EIS.

Response: As a part of the disposal site design, all material placed in the site, as well as any precipitation that falls on it, would be contained with no runoff. Please refer to paragraph 4.25 of this document.

3. Comment: The area which will be used as a transfer site should be restored in a manner suitable for its designation as a scenic resources zoning district.

Response The Crooked River does not appear on any updated Federal or State list as a designated Wild and Scenic River. However, once the proposed operations are completed, that area used as the transfer site would be returned to as near an original state as possible. All local, state, and Federal zoning codes and regulations would be followed.

4. Comments: The problem of leakage and spillage of spoil and water from the transport trucks should be addressed.

Response: Please refer to paragraph 4.33 page IV-8 of this report.

5. Comment: The Final EIS should chart the exact location of the proposed public use facilities so that impacts of construction and use on water quality could be more adequately evaluated.

Response: Please refer to page I-14 for the suggested chart.

6. Comment: The impact on the stream of maintaining a gravel surface on the proposed parking lot should be evaluated in addition to the black-top surface suggested.

Response: The selection of black-top surfacing was based on the small area to be covered, the low maintenance cost, and the lack of any potential adverse environmental impacts (see comment below).

7. Comment: Additionally, some sort of trap for runoff waters and sediment should be considered.

Response: Direct contact of any runoff from the parking lot with surrounding surface water sources is not anticipated. The distance between the parking lot and the Crooked River (approximately 130 feet), and the permeability of the surrounding soil would prevent any potentially harmful material from entering the Crooked River.

8. Comment: It should be noted that the implementation of best management practices to control surface runoff, being proposed by the 208 Agency in its water quality management plan, may reduce future sedimentation of the channel below the projected 1000 cy/yr accumulation.

Response: Thank you for your recommendation, it is noted in paragraph 3.02, page III-1 of this report.

### References

1. U.S. Department of Commerce, NOAA, Environmental Data Service, Climatological Summary - Pellston, MI, Ashville, NC, 1971.
2. Great Lakes Basin Commission (GLBC), Great Lakes Basin Framework Study. Appendix 3-Geology and Ground Water, GLBC, Ann Arbor, 1975.
3. Dorr, J.A., and D. F. Eschman, Geology of Michigan, The University of Michigan Press, Ann Arbor, MI, 1970.
4. Giroux, P.R. and J. Thompson, "Summary of Groundwater Conditions in Michigan - 1960", Michigan Geological Survey - Water Supply Report No. 5, 1961.
5. Scott, I.D., "Inland Lakes of Michigan", Michigan Geological and Biological Survey Publication No. 30, Geological Series 25, Lansing, MI, 1921.
6. U.S. Department of Agriculture Soil Conservation Service in cooperation with Michigan Agriculture Experiments Station. Soil Survey of Emmet County, MI, U.S. Government Printing Office, Washington, D.C., December, 1973.
7. Michigan Department of Public Health, Water Well Records, 1969 to 1977.
8. Ecker, E. J. and J. E. Green, "Field Evaluation of Compartment 81 - Hardwood State Forest", October 14, 1975.
9. Ecker, E. J. and J. C. Greene, Forest Management Plan - Hardwood State Forest, Emmet County, Michigan DNR Forest Management Division Unpublished Report, no date.
10. Department of Interior, Fish and Wildlife Service (FWLS), Endangered and Threatened Species Listing, Federal Register, Thursday 14 July 1977.
11. Michigan Department of Natural Resources, Michigan's Endangered and Threatened Species Program, Lansing, MI, December, 1976.
12. Michigan Department of Natural Resources, Air Quality Report, Lansing, MI, 1976.

13. Villican - Leman and Associates, Inc. Future Land Use Plan - Emmet County, MI., unpublished report, Southfield, MI, April, 1971.
14. Villican - Lehman and Associates, Inc., Farmers Home Administration Comprehensive Sewer and Water Plan, for Emmet County, unpublished report, Southfield, MI, April 1971.
15. Department of Interior, National Park Service, National Register of Historic Places, Federal Register, Volume 42, No. 21, Tuesday, February 1, 1977.
16. Hinsdale, W. B., Archaeological Atlas of Michigan, University of Michigan Press, Ann Arbor, 1931.
17. Fitting, J. E., The Archaeology of Michigan, Cranbrook Institute of Science, Bloomfield Hills, MI, 1975
18. U.S. Bureau of the Census, City and County Data Book, Washington, D. C., 1972.
19. Emmet County Office of Planning and Zoning, Zoning Ordinance, October 31, 1972.
20. Murdrock, A. Agricultural Studies on Dredged Spoils, Unpublished Report Canada Center for Inland Waters, Burlington, Ontario, 1975.
21. Murdrock, A. The Feasibility of Using Dredged Bottom Sediments as an Agricultural Soil, MS Thesis, McMasters University, Hamilton, Ontario, 1974.
22. Lee, C.R., R.M. Engler and L. J. Mahloch, "Land Application of Dredging, Construction and Demolition Waste Materials", in Land Application of Waste Materials, Soil Conservation Society of America, Ankeny, Iowa, 1976.
23. Council for Agricultural Science and Technology (CAST), Application of Sewage Sludge to Cropland, EPA - 430/9-76-013, November 1976.
24. Knezek, B. D. and R. H. Miller, eds., Application of Sludges and Wastewaters on Agricultural Land: A Planning and Evaluation Guide, Ohio Agricultural Research and Development Center Research Bulletin NO. 1090, Wooster, Ohio, 1976.
25. Pratt, P. F. and A. L. Page, "Leachate From Applications of Fertilizers, Manures and Sewage Sludge to Land," in Proceedings National Conference on Disposal of Residuals on Land, St. Louis, MO, September 13-15, 1976.

26. Pratt, P. R., F. E. Broadbent, and J. P. Martin, Using Organic Wastes as Nitrogen Fertilizers, California Agricultural 27(6):10-13, 1973.
27. Keeney, D. R., K. W. Lee, and L. M. Walsh. Guidelines for the Application of Wastewater Sludge to Agricultural Land in Wisconsin, Tech. Bull. No. 88, Department of Natural Resources, Madison, Wisconsin, 1975.
28. King, L. D., Mineralization and Gaseous Loss of Nitrogen in Soil-Applied Liquid Sewage Sludge, J. Environ. Quality 2:356-358, 1973.
29. Ryan, J. A., D. R. Keeney, and L. M. Walsh. "Nitrogen Transformation and Availability of an Aerobically Digested Sewage Sludge in Soil." J. Environ. Quality 2:489-492, 1973.
30. Carstea, D., J. Golden, and L. Thomas, Guidelines for the Analysis of Cumulative Environmental Effects of Small Projects in Navigable Waters, MITRE Technical Report, MTR-6939, June 1975.

## GLOSSARY

<b>Accretion</b>	- Natural or artificial buildup of land by the action of air or water deposition.	<b>Bike</b>	- A mound of earth, sand, clay or other substance on land or in the water designed and built to confine materials.
<b>Aerobic</b>	- Any biologic process which requires oxygen to function.	<b>Dissolved Solids</b>	- The total amount of dissolved material, organic and inorganic, contained in water or wastes.
<b>Anadromous</b>	- Type of fish that ascend rivers from the sea (or lake) to spawn.	<b>DO</b>	- Dissolved Oxygen. The oxygen freely available in water. Unpolluted water will contain more DO than polluted water.
<b>Anaerobic</b>	- Any biologic process which does not require oxygen to function.	<b>Dredge, Clam-Shell</b>	- A barge mounted crane with a split-bucket or clam-shell suspended from it, powered by steam or diesel, which operates by dropping its clam-shell to the bottom by gravity where it is closed and lifted, along with the sediments it catches, from the bottom by wire cables. Generally used for dredging soft sediments, sand and gravel.
<b>Aquatic Plants</b>	- Plants rooted in the substrate that grow in water, either floating on the surface, growing up from the bottom of the body of water, or growing under the surface of the water.	<b>Dredge, Hydraulic</b>	- A barge or ship mounted vacuum suction device, sometimes fitted with an "eggbeater" type cutter head, powered by steam or diesel, which operates by breaking up the sediments with the rotating cutter head and may pump the material from the bottom through pipes to a discharge point at some distance from the equipment, in the water, on land or into a confinement facility. Generally used for dredging muck, soft sediments or sand. Operates with about 20% solids and 80% water.
<b>Aquifer</b>	- A hydraulically continuous volume of the ground water which yields useful quantities of water to wells.	<b>Dredge, Ponar</b>	- A bottom sediment sampling device which operates similar to a clam-shell dredge. Usually used to sample soft muck, sand and fine gravel sediments and associated benthos during aquatic surveys.
<b>Artificial Nourishment</b>	- The process of replenishing a beach by artificial means.	<b>Dredging</b>	- A method for deepening and widening streams, swamps or coastal waters by scraping and removing solids from the bottom to restore the authorized depths in the established projects.
<b>Baymouth Bar</b>	- A bar extending partially or entirely across the mouth of a bay.	<b>Ecotone</b>	- The edge between two or more different communities (e.g., the transition between forest and grassland).
<b>Benthic</b>	- The water-substrate interface at the bottom of a stream, lake, (or harbor).	<b>Endangered Species</b>	- A species of plant or animal which is in danger of extinction throughout all or a significant part of its range.
<b>Benthos</b>	- Bottom dwelling organisms; uniformly applied to animals associated with substrates.	<b>Environmental Impacts</b>	- A phrase used to express the extent or severity of an environmental effect; the impact.
<b>Biomagnification</b>	- Increasing accumulation of a substance (such as mercury) from organism to organism in the food chain.	<b>Eutrophication</b>	- Natural processes which result in water quality reduction via nutrient enrichment. Eutrophication over time changes open lakes to swamps and eventually to dry land.
<b>BOD</b>	- Biochemical Oxygen Demand. A measure of the amount of oxygen consumed in the biological processes that break down organic matter in water.	<b>Fauna</b>	- The animals, terrestrial or aquatic, of a region.
<b>Breakwater</b>	- A long narrow (rubble mound) pile of rock, concrete or wood; a structure in the water designed to break or moderate the effect of storm driven waves. Usually placed out into the water from shore at an entry channel to provide safer boat or ship navigation during stormy weather.		
<b>Carrying Capacity.</b>	- Sustained use (or production) of the land without environmental degradation.		
<b>COO</b>	- Chemical Oxygen Demand. The amount of oxygen required to oxidize organic and oxidizable inorganic compounds in water.		
<b>Coliform</b>	- Any of a number of organisms common to the intestinal tract of man and animals, whose presence is an indicator of pollution.		
<b>Conductivity (Specific Conductance)</b>	- A measure of a solution's capacity to convey an electric current.		
<b>Coriolis Effect</b>	- The tendency of moving air masses to change direction continuously in response to the earth's rotation.		

Fecal Coliform	- A group of organisms common to the intestinal tract of man and of animals.	Percipitate	- Downward movement or infiltration of water through the pores or spaces of rock or soil.
Flora	- The plants, terrestrial or aquatic, of a region.	Permeable	- Able to allow water to seep through.
Food Chain	- Energy transformations - Movement of food from one form of life to another; for example, algae to zooplankton to fish.	pH	- A measure of the relative acid or alkaline state of water. pH is measured on a scale of 0 to 14. A pH of 7 is neutral, a pH below 7 is acid, a pH above 7 is alkaline. Rainwater is usually slightly acid.
Foredune	- That zone of shoreland immediately inland of the beach and the result of windblown sediment deposition.	Phenols	- A group of organic compounds that in very low concentrations produce a taste and odor problem in water.
Granular	- Sand and/or gravel in composition referring to sediments.	Phosphorus	- An element that while essential to life, contributes to the eutrophication of lakes and other bodies of water.
Ice Ages	- The late Pleistocene Epoch, a period of time which ended in Michigan approximately 8,000 years ago and which was marked by glaciers and extensive rising and lowering of the Great Lakes levels.	Phytoplankton	- The algae of the open water of lakes, rivers, and streams.
Impenetrable	- Able to confine water without any seepage.	Phytosociology	- A plant community of certain floristic composition and uniform environmental conditions.
Interface	- The point at which two substances, such as water and bottom sediments, come together.	Plans	- Permanent structures constructed of stone, steel, cement or a combination of those materials, which are used to define and stabilize entry channels from the open lake into a harbor.
Leach	- To remove a substance by water filtration or percolation.	Rare Species	- An extremely uncommon species limited in distribution.
Littoral	- The shallow waters that extend along the shoreline of a lake or sea.	Riprap	- A layer, facing or protective mound of stones randomly placed to prevent erosion, scour, or sloughing of a structure or embankment; also the stone so used.
Littoral Drift	- The sediments moved in the littoral zone under the influence of waves and current. Direction of movement or "transport" of littoral materials depends upon wind and wave direction.	Scow	- A barge equipped with trap-doors in its bottom which is used for moving and dumping dredge spoil.
Longshore Current	- Somewhat similar to littoral drift.	Sediments	- Clay, sand, gravel or stones which have been eroded from the land or from beneath the water, have been transported by river or lake currents, and re-deposited.
Low Water Datum	- LWD. An approximation to the plane of mean low water that has been adopted as a standard reference plane.	Setche	- Fluctuations above or below "normal" water level in a basin caused by wind, barometric pressure or a combination of both - resulting in a rise or fall on shore over a period of hours.
Marsh	- A wetland dominated by herbaceous vegetation; primarily sedges, reeds, and grasses.	Sheet Steel Piling	- Interlocking lengths of steel driven into a stream, lake or harbor bottom next to the shore to prevent storm, wave or ship damage.
Monitoring Program	- To study the amount of pollutants present in the environment.	Sheet	- A place where water is shallow, sometimes created by a sandbar, in the shipping channels, created by deposition of eroded material.
Mooring Facility	- A place where a ship, barge, or scow is fastened.	Site	- Finely divided particles of soil or rock. Often carried in cloudy suspension in water and eventually deposited as sediment.
Moraine	- Glacial till, or sediments deposited directly from ice.		
Nekton	- Aquatic organisms (larger than zooplankton) which swim freely in the water.		
Nutrient	- Elements or compounds essential as raw materials for organism growth and development; for example, carbon, oxygen, nitrogen, and phosphorus.		
Organic	- Material derived from organisms; leaves, sticks, animals, fish, etc.		
Outwash	- Sediments deposited directly from glacial meltwater streams or lakes.		

Spill	- Sediments which have been dredged from beneath the water.
Staging Area	- Major concentrations of waterfowl or shorebirds occurring on certain lakes and ponds during spring and fall migration.
Succession	- The change in species composition from initial colonizing organisms to members of a diverse stable community.
Surface Water	- Atmospheric water that runs off to collect in streams, ponds, lakes, swamps, marshes, etc.
Terrace	- A level area marking a period of constant lake water elevation.
Terrane	- The general natural setting of the land surface of an area as imparted by a particular geological process.
Threatened Species	- A species which is likely to become endangered because of low reproductive capacity, loss of suitable habitat or over-kill, now limited in numbers to few isolated populations.
TKN	- Total Kjeldahl Nitrogen. A measure of the ammonia and organic nitrogen, but does not include nitrite and nitrate nitrogen.
Tombolo	- A sand or gravel bar connected from shore to an island or off-shore structure.
Topography	- The configuration of the landscape including its relief, the position of its natural and man-made features.
Trophic	- Food chain relationships in an ecosystem.
Turbidity	- A cloudy condition in water due to the suspension of silt or finely divided organic matter.
Visual Vulnerability	- The sensitivity of the landscape to accommodate a given use (e.g., a disruption of natural landscape features).
Volatile Solids (Total)	- A measure of the organic material that could decompose and thus exert an oxygen demand on a body of water.
Wave	- A ridge, deformation, or undulation of the surface of a liquid.
Wetland	- Habitats characterized by aquatic or semi-aquatic plants that are permanently wet, or intermittently water covered.
Zinc	- Zinc (Zn) is a heavy metal which in trace quantities is essential to life, but which in greater quantities may be toxic to life.
Zooplankton	- Animal microorganisms living unattached in the water.

**APPENDIX A**  
**EPA SEDIMENT ANALYSIS**

**INLAND ROUTE, MICHIGAN**

**REPORT ON THE DEGREE OF POLLUTION OF  
BOTTOM SEDIMENTS**

**SAMPLED: OCTOBER 29, 1975**

**U.S. ENVIRONMENTAL PROTECTION AGENCY  
REGION V  
GREAT LAKES SURVEILLANCE BRANCH**

## DISCUSSION OF RESULTS

The sediments sampled are composed of a 2:1 mixture of silt and medium to coarse sand. The sediments had high concentrations of decomposing organic matter and algae (Table I and Table III).

The bulk sediment analysis results (Table II) indicate high organic pollution at all sites, moderate to heavy lead and barium pollution, and low to moderate nickel and copper pollution. The replicate sample collected at INR75-2 exhibits light to moderate organic pollution, and no metals pollution. The replicate indicates the high degree of variability in the sediment quality which can occur in the area.

The elutriate test results (Table IV) indicate some release of COD, TOC, TKN and ammonia. The elutriate data indicate comparable release rates for INR75-2 and INR75-2 replicate, even though the bulk sediment analysis data (Table II) showed INR75-2 replicate to be much less polluted than INR75-2. The sieve analysis (Table III) indicates that both samples have similar silt and clay size fractions. This fine fraction would be expected to have the greatest potential for dissolution, and this may be the reason for the comparable elutriate results.

The macroinvertebrate results (Table V) indicate a very high species diversity. The taxa cover the entire range of pollution tolerance, from intolerant to tolerant. No toxicity problems are indicated.

Considering all of the data, all sites sampled are classified as moderately to heavily polluted. Therefore, sediments dredged from the navigation channel from Burt Lake to Crooked Lake should be contained.

Comparison of the results of the present survey with those of a survey conducted by the Michigan District Office on 8 July 1970 indicate an abatement of pollution in the interim.

TABLE I  
FIELD OBSERVATIONS

HARBOR: Inland Route, Michigan

SAMPLED: October 29, 1975

STATION NO.	DEPTH (ft.)	COLOR	OBSERVATIONS		ODOR	OIL	GENERAL REMARKS
				SAMPLE DESCRIPTION			
INR 75-1	8	Dark grey		Sand and silt	Algae, None septic		Rotted plants
INR 75-2	6	Dark grey and black		Sand and silt	Algae, septic		Algae
INR 75-2 Replicate	6	Dark grey and black		Sand and silt	Strong septic		Sludge worms
INR 75-3	6	Dark grey		Sand and silt	Septic	None	Sludge worms
INR 75-4	5	Grey		Sand and silt	Strong septic	Moder- ate	Sludge worms
INR 75-5	7	Grey		Sand and silt	Algae	None	

**TABLE II**  
**BULK SEDIMENT ANALYSIS RESULTS**

HARBOR: Inland Route, Michigan  
SAMPLED: October 29, 1975

<u>PARAMETER</u>	<u>INR75-1</u>	<u>INR75-2</u>	<u>INR75-3</u>	<u>INR75-4</u>	<u>INR75-5</u>
Total Solids %	35.5	40.4	59.0	24.9	51.9
Volatile Solids %	11.7	9.11	4.20	21.0	13.3
Chem Oxy. Demand	150,000	140,000	57,000	280,000	83,000
T. Kjel. Nitrogen	4,200	5,300	1,500	7,800	5,600
Oil-Grease	500	600	400	1,400	1,100
Mercury	<0.1	<0.1	<0.1	<0.1	<0.1
Lead	51	45	<10	66	75
Zinc	54	66	23	73	69
T. Phosphorous	140	370	140	550	430
Ammonia Nitrogen	110	95	44	180	170
Manganese	180	150	53	170	160
Nickel	20	20	<8	27	26
Arsenic	3	<2	<2	<2	<2
Barium	67	75	<20	85	92
Cadmium	<2	<2	<2	<2	<2
Chromium	14	17	8	21	17
Magnesium	15,400	10,300	4,900	12,200	10,000
Copper	24	34	13	27	26
Iron	4,400	6,300	2,700	5,900	4,600

All values mg/kg dry weight unless otherwise noted.

TABLE III  
SIEVE ANALYSIS RESULTS

HARBOR: Inland Route, Michigan

SAMPLED: October 29, 1975

SIEVE NO. AND DESCRIPTION	SEDIMENT SIZE ANALYSIS BY PERCENT AT EACH STATION				
	INR 75-1	INR 75-2	INR 75-2 (Replicate)	INR 75-3	INR 75-4
<b>Retained on</b>					
#10 Medium Gravel and larger	8	16	3	8	9
<b>Retained on</b>					
#20 Fine gravel	6	2	3	4	6
<b>Retained on</b>					
#60 Medium and course sand	12	22	<1	12	26
<b>Retained on</b>					
#200 Fine sand	8	8	51	5	8
<b>Passing #200</b>					
Silts and clays	66	52	43	71	51
					30

HARBOR: Inland Route, Michigan  
 SAMPLED: October 29, 1975

TABLE IV  
 ELUTRIATE TEST RESULTS

PARAMETER	<u>INR75-1</u>	ELUTRIATE WATER USING SEDIMENTS AT EACH STATION			<u>INR75-5</u>
		<u>INR75-2</u>	<u>INR75-3</u>	<u>INR75-4</u>	
		<u>replicate</u>			
Chem. Oxy. Demand (mg/l)	32	35	36	19	26
Total Organic Carbon "	10	14	9	7	9
T. Kjel. Nitrogen "	3.30	3.20	2.60	4.56	3.52
Ammonia Nitrogen "	2.70	2.70	1.83	4.08	3.05
Nitrate + Nitrite-N "	0.23	0.17	0.23	0.22	0.25
T. Phosphorous "	0.036	0.028	0.100	0.063	0.039
Ortho-P "	0.007	0.012	0.061	0.046	0.016
Arsenic (µg/l)	5	5	4	<2	<2
Cadmium "	0.1	0.1	0.1	0.1	<0.1
Chromium "	<5	<5	<5	<5	<5
Copper "	<5	<5	<5	<5	<5
Iron "	48	44	70	37	61
Lead "	<2	<2	<2	2	<2
Mercury "	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel "	<75	<75	<75	<75	<75
Zinc "	<10	<10	<10	<10	<10

TABLE V  
MACROINVERTEBRATES

HARBOR: Inland Route, Michigan

SAMPLED: October 29, 1975

DIPTERA	TAXA	NUMBER OF ORGANISMS FOR EACH TAXA		
		INR75-1	INR75-3	INR75-5
	<i>Tribolos</i> sp.	16	76	46
	<i>Chironomus</i> sp.	2	1	2
	<i>Conchapelopia</i> sp.	1		
	<i>Microtendipes</i> sp.	4		
	<i>Polytendipes</i> sp.	15	2	
	<i>Psectrocladius</i> sp.	1		
	<i>Procladius</i> sp.	3	8	
	<i>Coeilotanypus</i> sp.	2		
	<i>Tarytarsus</i> sp.		4	
	<i>Clinotanypus</i> sp.		4	3
	<i>Stictochironomus</i>			1
	<i>Chaoborus</i> sp.			1
TRICHOPTERA	<i>Phyllocentropus</i> sp.	10	1	
	<i>Neurectipus</i> sp.		1	
	<i>Polycentropus</i> sp.		1	11
	<i>Cyrenellus marginalis</i>			
ODONATA	<i>Libellula quadrimaculata</i>		3	
EPHEMEROPTERA	<i>Pentagenia</i> sp.	2		
	<i>Sauvagea</i> sp.	3		
	<i>Leptophlebiidae</i>	1		
	<i>Bastis</i> sp.			6
	<i>Hemagenia limbata</i>		11	29
COLEOPTERA	<i>Dubiaphia</i> sp.			2
HECETOPTERA				
	<i>Sialis</i> sp.	12		7

TABLE V - Continued  
MACROINVERTEBRATES

HARBOR: Inland Route, Michigan

SAMPLED: October 29, 1975

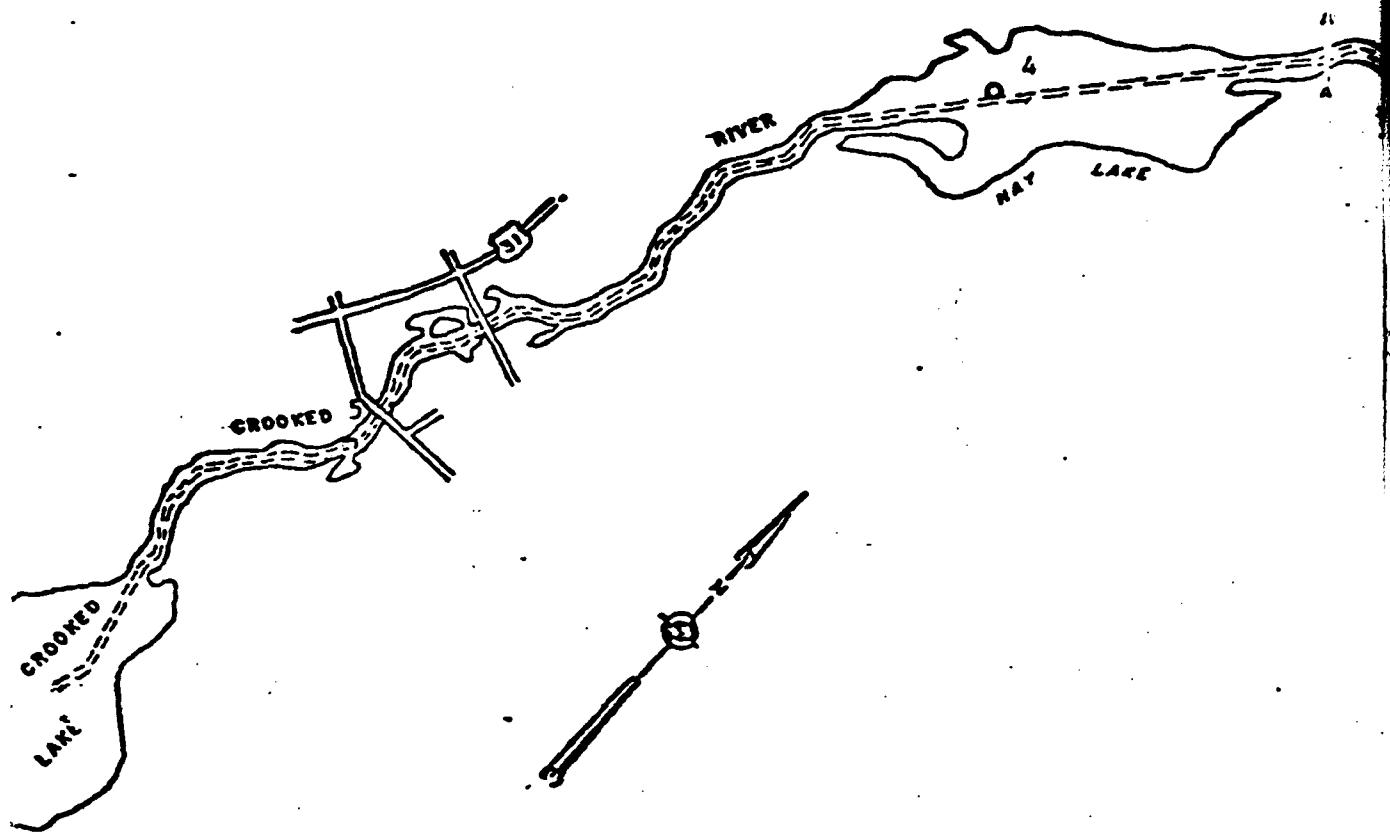
TAXA	NUMBER OF ORGANISMS FOR EACH TAXA		
	INR75-1	INR75-3	INR75-5
LEPIDOPTERA			
<i>Mympheala</i> sp.	4		
OLIGOCHAETA			
<i>Limnodrilus</i> sp.	4	11	8
<i>Lumbricidae</i>	3		1
<i>Tubifex</i> sp.			
<i>Lumbriculus variegatus</i>		3	
<i>Enchytraeidae</i>		2	
HIRUDINEA			
<i>Dina</i> sp.	2		
<i>Helobdella stagnalis</i>	2		
CLADOCERA			
<i>Cladocera</i> #1	1		
ISOPODA			
<i>Acartia</i> racovitzai	7		
<i>Liretta</i> lineatus	43		
<i>Acartia</i> sinuata	1		
<i>Acartia</i> sp.		3	
AMPHIPODA			
<i>Gammarus</i> sp.	32		
<i>Hyalinella azteca</i>		25	
<i>Gammaurus fasciatus</i>	138		
DECOPODA			
<i>Astacidae</i> (immature)	2		
NEMATODA			
<i>Nematoda</i> sp.	1		

TABLE V, continued  
MACROINVERTEBRATES

HARBOR: Inland Route, Michigan

SAMPLED: October 29, 1975

TAXA	NUMBER OF ORGANISMS FOR EACH TAXA		
	INR75-1	INR75-3	INR75-5
<b>PELECYPODA</b>			
<i>Sphaerium simile</i>			
<i>Pisidium ventricosum</i>		3	
<i>Pisidium</i> sp.		6	
<i>Pisidium walkeri</i>	7	1	
<i>Sphaerium rhomboideum</i>	3		
<i>Pisidium dubium</i>	2		
<b>GASTROPODA</b>			
<i>Bithynia tentaculata</i>	1		
<i>Phryea</i> sp.	1		
<b>TURBELLARIA</b>			
<i>Turbellaria</i> sp.	1	1	1
<i>Dugesia</i> sp.			
Total No. of organisms	600	176	162
Total No. of taxa	27	22	16



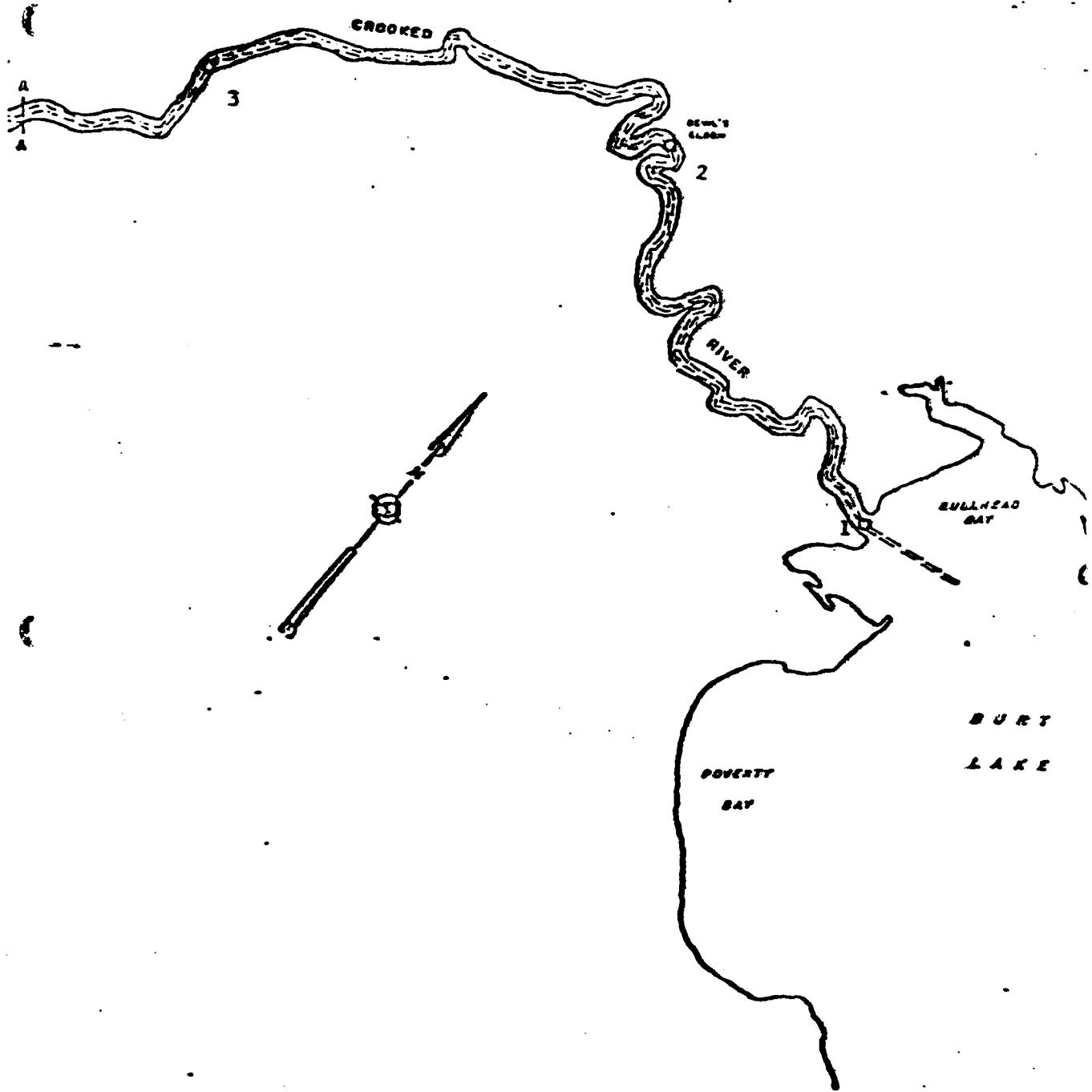
● INR75 Sample Sites

Scale of Feet  
0 1000 2000 3000

A-11

SEDIMENT SURVEY  
THE INLAND ROUTE

U.S. ENVIRONMENTAL PROTECTION AGENCY  
GREAT LAKES SURVEILLANCE BRANCH



• HMR75 Sample Sites

Scale of Feet  
0 1000 2000 3000

A-12

SEDIMENT SURVEY  
THE INLAND ROUTE

U.S. ENVIRONMENTAL PROTECTION AGENCY

**APPENDIX B**  
**EPA CRITERIA**

GUIDELINES FOR THE POLLUTIONAL CLASSIFICATION  
OF GREAT LAKES HARBOR SEDIMENTS

U.S. ENVIRONMENTAL PROTECTION AGENCY  
REGION V  
CHICAGO, ILLINOIS  
April, 1977

Guidelines for the evaluation of Great Lakes harbor sediments, based on bulk sediment analysis, have been developed by Region V of the U.S. Environmental Protection Agency. These guidelines, developed under the pressure of the need to make immediate decisions regarding the disposal of dredged material, have not been adequately related to the impact of the sediments on the lakes and are considered interim guidelines until more scientifically sound guidelines are developed.

The guidelines are based on the following facts and assumptions:

1. Sediments that have been severely altered by the activities of man are most likely to have adverse environmental impacts.
2. The variability of the sampling and analytical techniques is such that the assessment of any sample must be based on all factors and not on any single parameter with the exception of mercury and polychlorinated biphenyls (PCB's).
3. Due to the documented bioaccumulation of mercury and PCB's, rigid limitations are used which override all other considerations.

Sediments are classified as heavily polluted, moderately polluted, or nonpolluted by evaluating each parameter measured against the scales shown below. The overall classification of the sample is based on the most predominant classification of the individual parameters. Additional factors such as elutriate test results, source of contamination particle size distribution, benthic macroinvertebrate populations, color, and odor are also considered. These factors are interrelated in a complex manner and their interpretation is somewhat subjective.

The following ranges used to classify sediments from Great Lakes harbors are based on compilations of data from over 100 different harbors since 1967.

	<u>NONPOLLUTED</u>	<u>MODERATELY POLLUTED</u>	<u>HEAVILY POLLUTED</u>
Volatile Solids (%)	<5	5 - 8	>8
COD (mg/kg dry weight)	<40,000	40,000-80,000	>80,000
TKN     "     "     "	<1,000	1,000-2,000	>2,000
Oil and Grease (Hexane Solubles) (mg/kg dry weight)	<1,000	1,000-2,000	>2,000
<u>Lead</u> (mg/kg dry weight)	<40	40-60	>60
<u>Zinc</u> "     "     "	<90	90-200	>200

The following supplementary ranges used to classify sediments from Great Lakes harbors have been developed to the point where they are usable but are still subject to modification by the addition of new data. These ranges are based on 260 samples from 34 harbors sampled during 1974 and 1975.

	<u>NONPOLLUTED</u>	<u>MODERATELY POLLUTED</u>	<u>HEAVILY POLLUTED</u>
Ammonia (mg/kg dry weight)	<75	75-200	>200
Cyanide "	" "	<0.10	0.10-0.25
Phosphorus "	" "	<420	420-650
<u>Iron</u>	" "	<17,000	17,000-25,000
<u>Nickel</u>	" "	<20	20-50
<u>Manganese</u>	" "	<300	300-500
<u>Arsenic</u>	" "	<3	3-8
<u>Cadmium</u>	" "	*	*
<u>Chromium</u>	" "	<25	25-75
<u>Barium</u>	" "	<20	20-60
<u>Copper</u>	" "	<25	25-50

\*Lower limits not established

The guidelines stated below for mercury and PCB's are based upon the best available information and are subject to revision as new information becomes available.

Methylation of mercury at levels  $\geq$  mg/kg has been documented (1,2). Methyl mercury is directly available for bioaccumulation in the food chain.

Elevated PCB levels in large fish have been found in all of the Great Lakes. The accumulation pathways are not well understood. However, bioaccumulation of PCB's at levels  $\geq$  10 mg/kg in fathead minnows has been documented (3).

Because of the known bioaccumulation of these toxic compounds, a rigid limitation is used. If the guideline values are exceeded, the sediments are classified as polluted and unacceptable for open lake disposal no matter what the other data indicate.

	<u>POLLUTED</u>
<u>Mercury</u>	$\geq$ 1 mg/kg dry weight
Total PCB's	$\geq$ 10 mg/kg dry weight

The pollutional classification of sediments with total PCB concentrations between 1.0 mg/kg and 10.0 mg/kg dry weight will be determined on a case-by-case basis.

a. Elutriate test results.

The elutriate test was designed to simulate the dredging and disposal process. In the test, sediment and dredging site water are mixed in the ratio of 1:4 by volume. The mixture is shaken for 30 minutes, allowed to settle for 1 hour, centrifuged, and filtered through a 0.45  $\mu$  filter. The filtered water (elutriate water) is then chemically analyzed.

A sample of the dredging site water used in the elutriate test is filtered through a 0.45  $\mu$  filter and chemically analyzed.

A comparison of the elutriate water with the filtered dredging site water for like constituents indicates whether a constituent was or was not released in the test.

The value of elutriate test results are limited for overall pollutional classification because they reflect only immediate release to the water column under aerobic and near neutral pH conditions. However, elutriate test results can be used to confirm releases of toxic materials and to influence decisions where bulk sediment results are marginal between two classifications. If there is release or non-release, particularly of a more toxic constituent, the elutriate test results can shift the classification toward the more polluted or the less polluted range, respectively.

b. Source of sediment contamination.

In many cases the sources of sediment contamination are readily apparent. Sediments reflect the inputs of paper mills, steel mills, sewage discharges, and heavy industry very faithfully. Many sediments may have moderate or high concentrations of TKN, COD, and volatile solids yet exhibit no evidence of man made pollution. This usually occurs when drainage from a swampy area reaches the channel or harbor, or when the project itself is located in a low lying wetland area. Pollution in these projects may be considered natural and some leeway may be given in the range values for TKN, COD, and volatile solids provided that toxic materials are not also present.

c. Field observations.

Experience has shown that field observations are a most reliable indicator of sediment condition. Important factors are color, texture, odor, presence of detritus, and presence of oily material.

Color. A general guideline is the lighter the color the cleaner the sediment. There are exceptions to this rule when natural deposits have a darker color. These conditions are usually apparent to the sediment sampler during the survey.

Texture. A general rule is the finer the material the more polluted it is. Sands and gravels usually have low concentrations of pollutants while silts usually have higher concentrations. Silts are frequently carried from polluted upstream areas, whereas, sand usually comes from lateral drift along the shore of the lake. Once again, this general rule can have exceptions and it must be applied with care.

Odor. This is the odor noted by the sampler when the sample is collected. These odors can vary widely with temperature and observer and must be used carefully. Lack of odor, a beach odor, or a fishy odor tends to denote cleaner samples.

Detritus. Detritus may cause higher values for the organic parameters COD, TKN, and volatile solids. It usually denotes pollution from natural sources. Note: The determination of the "naturalness" of a sediment depends upon the establishment of a natural organic source and a lack of man made pollution sources with low values for metals and oil and grease. The presence of detritus is not decisive in itself.

Oily material. This almost always comes from industry or shipping activities. Samples showing visible oil are usually highly contaminated. If chemical results are marginal, a notation of oil is grounds for declaring the sediment to be polluted.

d. Benthos.

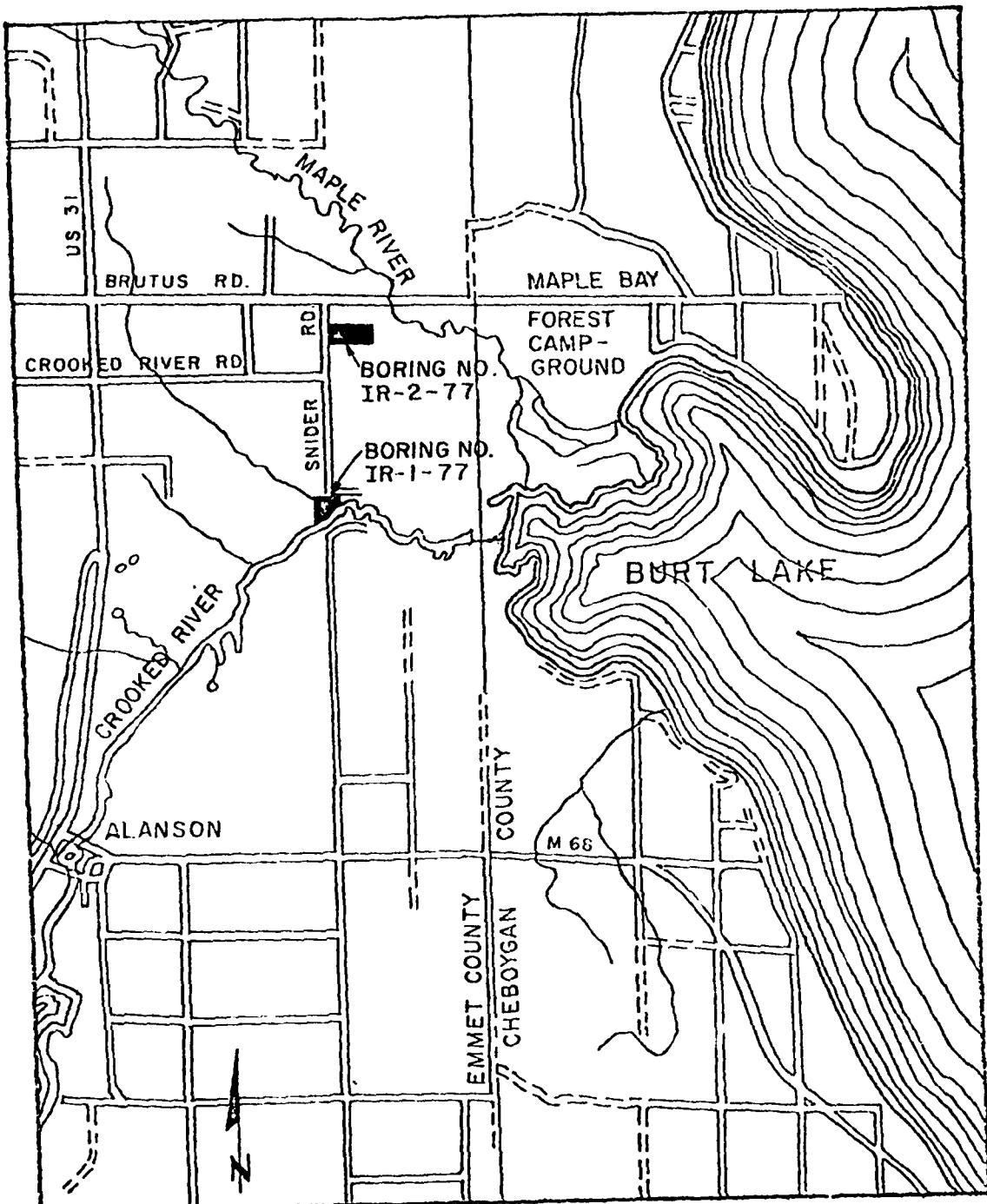
Classical biological evaluation of benthos is not applicable to harbor or channel sediments because these areas very seldom support a well balanced population. Very high concentrations of tolerant organisms indicate organic contamination but do not necessarily preclude open lake disposal of the sediments. A moderate concentration of oligochaetes or other tolerant organisms frequently characterizes an acceptable sample. The worst case exists when there is a complete lack or very limited number of organisms. This may indicate a toxic condition.

In addition, biological results must be interpreted in light of the habitat provided in the harbor or channel. Drifting sand can be a very harsh habitat which may support only a few organisms. Silty material, on the other hand, usually provides a good habitat for sludgeworms, leeches, fingernail clams, and perhaps, amphipods. Material that is frequently disturbed by ship's propellers provides a poor habitat.

REFERENCES

1. Jensen, S., and Jernelov, A., "Biological Methylation of Mercury in Aquatic Organisms," Nature, 223 August 16, 1969 pp 753-754.
2. Magnuson, J.J. Forbes, A., and Hall, R., "Final Report - An Assessment of the Environmental Effects of Dredged Material Disposal in Lake Superior - Volume 3: Biological Studies," Marine Studies Center, University of Wisconsin, Madison, March, 1976.
3. Halter, M.T., and Johnson, H.E., "A Model System to Study the Release of PCB from Hydrosoils and Subsequent Accumulation by Fish," presented to American Society for Testing and Materials, Symposium on Aquatic Toxicology and Hazard Evaluation," October 25-26, 1976, Memphis, Tennessee

**APPENDIX C**  
**SOIL BORING LOGS**

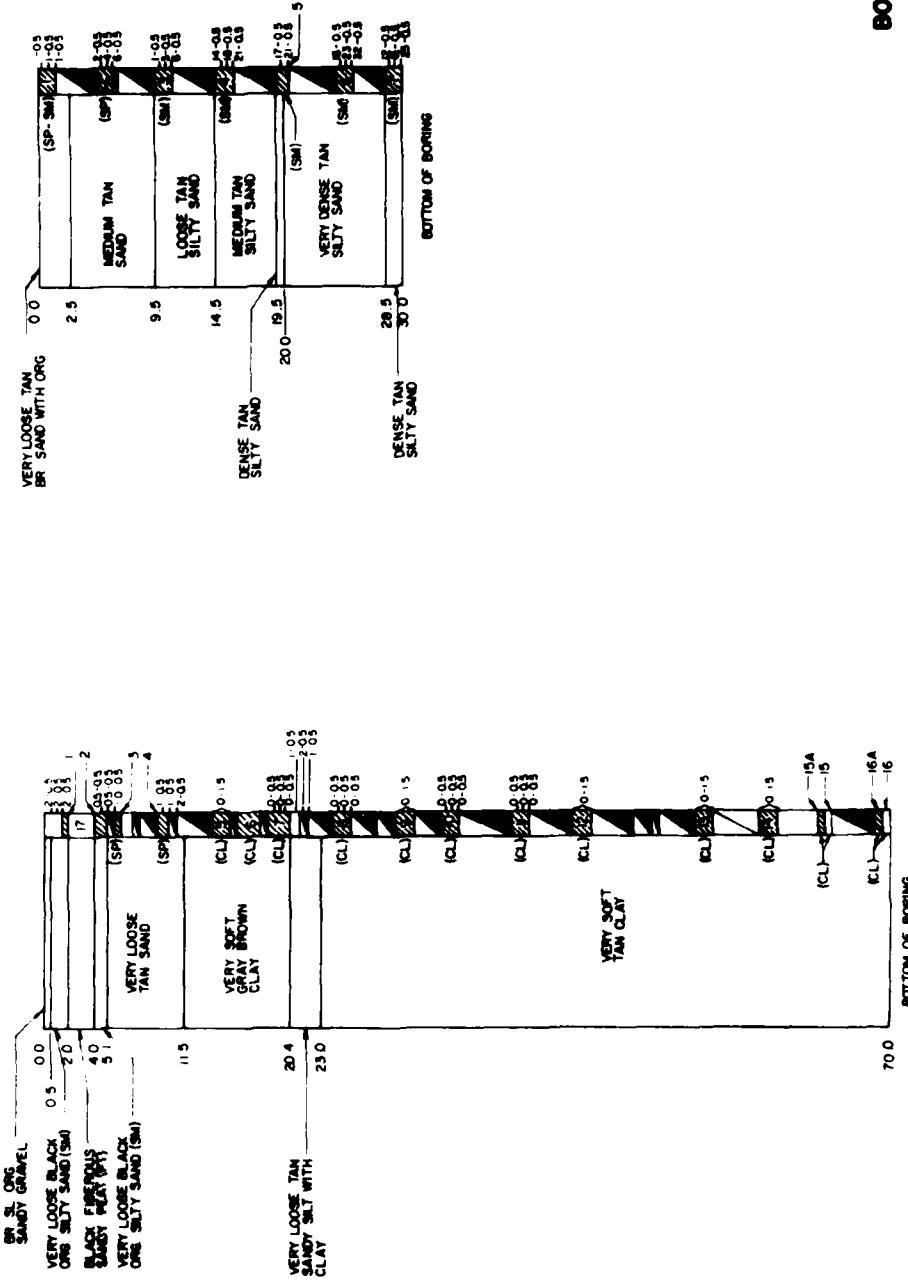


### BORING LOCATION PLAN

ELEV. FOR IR-1-77 = 595.2 (I.G.L.D., 1955)  
ELEV. FOR IR-2-77 = 629.7 (U.S.G.S., 1929)

0 1 2  
SCALE IN MILES

BORING NO. IRI-177  
23 JUNE 1977  
(REV 18 AUG 1977)



C-3

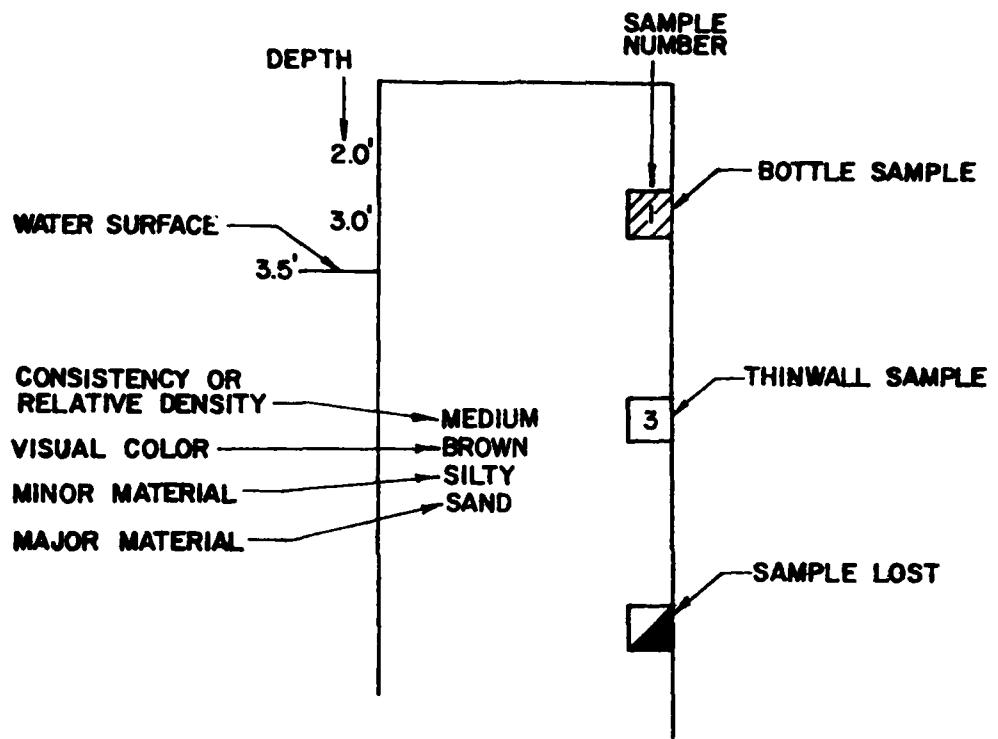
BOTTOM OF BORING

70.0

BOTTOM OF BORING

70.0

BORING LOGS



BORING LOG LEGEND

### **RELATIVE DENSITY & CONSISTENCY TABLE**

<b>SAND, SILT RELATIVE DENSITY</b>		
<b>NO. OF BLOWS REQ'D TO DRIVE A SAMPLE 1 FT. USING A 140# HAMMER FALLING 30".</b>	<b>2" O.D. SAMPLER (STD. PEN)</b>	
<b>SAMPLE DESCRIPTION</b>		
VERY LOOSE	< 4	
LOOSE	4 - 10	
MEDIUM	10 - 30	
DENSE	30 - 50	
VERY DENSE	> 50	

<b>CONSISTENCY OF CLAY</b>		
<b>NO. OF BLOWS REQ'D TO DRIVE A SAMPLE 1 FT. USING A 140# HAMMER FALLING 30".</b>	<b>2" O.D. SAMPLER (STD. PEN)</b>	
<b>CONSISTENCY OF CLAY</b>		
VERY SOFT	< 2	
SOFT	2 - 4	
MEDIUM	4 - 8	
STIFF	8 - 15	
VERY STIFF	15 - 30	
HARD	> 30	

**APPENDIX D**  
**PERTINENT CORRESPONDENCE**

MICHIGAN DEPARTMENT OF STATE  
RICHARD H. AUSTIN SECRETARY OF STATE



LANSING  
MICHIGAN 48918

July 27, 1977

MICHIGAN HISTORY DIVISION  
ADMINISTRATION, ARCHIVES,  
HISTORIC SITES, AND PUBLICATIONS  
3423 N Logan Street  
517-373-0610  
STATE MUSEUM  
606 N. Washington Avenue  
517-373-0616

Mr. David M. Barber  
SCS 11800 Sunrise Valley Drive  
Reston, Virginia 22091

Dear Sir:

Our staff has reviewed the following project and concludes that it will have no effect on cultural resources.

Material Disposal Site, Brutus, Emmet County

If you have further questions, please contact Dr. Lawrence Finfer, Environmental Review Coordinator for the Michigan History Division. Thank you for giving us the opportunity to comment.

Sincerely yours,

A handwritten signature in black ink, appearing to read "Martha M. Bigelow".

Martha M. Bigelow  
Director, Michigan History Division  
and  
State Historic Preservation Officer

MMB/LF/cw



# United States Department of the Interior

FISH AND WILDLIFE SERVICE

Federal Building, Fort Snelling  
Twin Cities, Minnesota 55111

IN REPLY REFER TO:

LWR

FEB 23 1977

Colonel Melvyn D. Remus  
U. S. Army Engineer District  
Detroit  
P.O. Box 1027  
Detroit, MI 48231

Dear Colonel Remus:

This letter responds to Mr. Malamud's letter of February 1, 1977 which presented the minutes of the Site Selection Committee Meeting held on January 20, 1977 at the Sheraton Motel, Romulus, Michigan. The meeting concerned the selection of dredge disposal sites for Frankfort, Les Cheneaux, Inland Route, Harbor Beach, St. Joseph, Port Austin and Sebewaing, Michigan. Our comments and questions on the dredge disposal site for Sebewaing will be sent to your office at a later date for inclusion in the expanded environmental assessment.

The following comments are made in regard to our position on the selected sites at the January 20, 1977 meeting:

Frankfort, MI: We reported on this project in coordination letters dated October 20, 1976 and December 7, 1976. We have no objections to the use of the BOR (site 4) and Luedke (site 5) sites as interim sites with the excess dredge material trucked to the Betsie River State Forest (site 9).

Les Cheneaux, Cedarville, MI: This project was reported on in coordination letters dated October 20, 1976 and December 7, 1976. We have no objections to the use of the Township Landfill (site 1) as the final disposal site. All other interim sites are unacceptable except the boat launch ramp (site 2A). Note "e" is incorrect on the memorandum of understanding which is attached to the February 1, 1977 letter and was added after we had signed the statement. Concerning note "e", we stated we would look at the golf course site (site 3) and other alternatives only after the boat launch ramp (site 2A) site proved to be unacceptable.

Inland Route, Burt Lake, MI: This project was reported on in coordination letters dated October 20, 1976 and December 7, 1976. We have no objection to the use of the river site (site 1) at the end of Snyder Road as an interim site. The use of Michigan Department of Natural Resources (MDNR) property east of Snyder Road (site 2) and the Burt

Township Landfill (site 6) as permanent disposal sites are not objectionable to us. Approval of the MDNR barrow pit located south of Brutus Road (site 5) is withheld until an adequate field investigation can be made by our representative in the spring.

Harbor Beach, MI: This project was reported on in coordination letters dated October 30, 1974 and October 23, 1975. We have no objections to the use of the city-owned property north of town (site 1) as an interim site, and we have no objections to the final disposal site, the county-owned gravel pit (site 3).

Port Austin, MI: This project was reported on in coordination letters dated June 11, 1975 and January 6, 1977. We have no objection to the elliptical shape of the offshore disposal site (site C) at Port Austin, provided it is of rubble mound construction. We are not opposed to the location of the causeway connection to site C at the east end of Bird Creek bathing beach (site A) as long as fisherman access is also a part of the plan.

St. Joseph, MI: This project was reported on in coordination letters dated: October 25, 1974; July 21, 1975; August 8, 1975; and October 22, 1976. We have not been able to examine the alternate disposal site on Whirlpool property (site 10) at St. Joseph. We will not be able to determine this site's suitability as a disposal site until a field examination is performed in the spring.

Sincerely yours,

*Charles A. Hughelett*

Charles A. Hughelett  
Acting Regional Director



UNITED STATES  
ENVIRONMENTAL PROTECTION AGENCY  
REGION V  
230 SOUTH DEARBORN ST  
CHICAGO ILLINOIS 60604

MAR 11 1977

Mr. Bernard Malamud  
Acting Chief  
Engineering Division  
Detroit District, Corps of Engineers  
Box 1027  
Detroit, Michigan 48231

Dear Mr. Malamud:

Reference is made to your letter of February 1, 1977, concerning E.P.A.'s position on alternate dredge material disposal sites at Frankfort, Les Cheneaux, Inland Route, Harbor Beach, St. Joseph, Port Austin, and Sebewaing, Michigan as discussed by the Site Selection Committee at their January 20, 1977 meeting. We trust the following information will clarify our position on each project proposed for the above harbors.

Frankfort

The Committee discussed two feasible alternatives for dredge material disposal at Frankfort: to fill the Bureau of Outdoor Recreation (BOR) Site No. 4 and truck excess material to the State forest property or use the Luedtke property, Site No. 5 as an interim holding area and truck all the material to the State forest property. Another alternative discussed involved using the Luedtke and State forest property for the backlog material until the BOR site is available. We do not anticipate any significant adverse impacts with any of the above sites and concur with developing sites 4 and 5 as interim sites and the State forest as the ultimate site.

Les Cheneaux

We have attended a meeting subsequent to the Site Selection Committee Meeting on spoil disposal at Les Cheneaux at State Senator Davis's office in Lansing. Due to objections expressed by the Michigan Department of Natural Resources, U.S. Fish and Wildlife Service and our Agency with regard to the wetland area involved, we understand that Site No. 4 (adjacent to the Taylor Lumber Company) is no longer under consideration. Based on our preliminary review, we would concur with development of either Sites 2a and/or 2b with final deposition at the Township dump. The final assessment of Sites No. 2a and 2b should include impacts associated with trucking the spoil i.e., adequacy of local roads to accomodate trucks, spoil slippage from trucks, noise impacts etc.

Inland Route

We concur with the use of the Site Nos. 1 and 2 as interim storage areas and Nos. 5 and 6 for final deposition of dredged material.

Harbor Beach

We concur with the use of the City-owned property at Site No. 1 as an interim drying area and final deposition at the county-owned gravel pit (Site No. 3) at Harbor Beach.

St. Joseph

We concur that Site 7 (Mallable) and Site 8 (ships canal) are acceptable for spoil disposal at St. Joseph Harbor. We conducted a field investigation of Site 10 on March 9, 1977, and found it to be acceptable as well.

Port Austin

Our November 1, 1976, letter to your office indicated that we preferred the village lagoon site (Site E) for confined disposal at Port Austin. We understand from the Site Selection Committee meeting that this upland site is no longer available for spoil disposal. Since there are no apparent environmental problems with the island site (Site C), we will concur with a decision to proceed with its design. More specific information on the facility's affects on littoral processes, harbor water quality, etc. should be included in subsequent assessments.

Sebewaing

We understand that the development of Site A-1 at Sebewaing and its ultimate use as an airport runway extension has the support of the local community. We also note your proposal to replace the 7 to 8 acres of wetlands that would be lost with construction of Site A-1 with an equivalent area in deeper water and adjacent to the navigation channel. However, considering the value of existing wetlands at Site A-1, our Agency finds construction of a confined facility there unacceptable until all feasible alternatives to wetland destruction have been thoroughly evaluated.

We commend your efforts to derive public benefit in developing a dike disposal area for polluted materials and your offer to mitigate wetland loss. We believe your proposal to replace wetlands presents an excellent method of compensation for projects which have already adversely impacted wetlands, as well as for future projects for which there is no other alternatives that would avoid wetland impacts. We would be pleased to see such a research effort undertaken. But we do not believe such mitigation is appropriate in a situation where the initial destruction of wetlands can be avoided.

It was agreed upon conclusion of the Site Selection Committee Meeting that the Corps would prepare an expanded Environmental Assessment for the Sebewaing project which would be distributed to all Committee members for their review and comment. We believe the following information should be included in the expanded assessment to evaluate both the potential and the impacts of the proposed airport runway extension and flood protection associated with development of Site A-1.

1. The feasibility as well as a need of runway extension should be thoroughly addressed. It should be determined if airport officials have initiated any steps to extend the airport runway; these steps should be explained. Would runway extension be solely a local project or would there be State or Federal monetary or licensing involvement. The probability of such Federal or State approval should be investigated. It should be determined if the project would result in any change in the number of operations or type of aircraft at the airport.
2. The details of flood protection potential with development of Site A-1 should be thoroughly addressed. The degree of past flooding and costs of damages incurred should be determined. Alternative flood protection methods (both structural and non-structural) for areas impacted should be compared with regard to effectiveness, environmental effects, costs, and benefits.
3. The feasibility of marsh construction should be discussed with specific regard to the type of fresh water habitat typical to the study area. The quality of the existing marsh should be determined and compared to that which would be constructed. Some attempt should be made to quantify comparable wetlands in the study area. If possible, a comparison should be made regarding the acreage of comparable wetland which has already been lost to development in the study area. Finally, the timing of wetland construction should be discussed, i.e., would development of Site A-1 be implemented after (or before) marsh construction?
4. The feasibility of alternatives to construction in the wetlands should be thoroughly evaluated. The potential use of dredge spoil as a beneficial resource e.g., as construction material, land fill, and/or agricultural cover should be addressed. Impacts with regard to transporting dredge material should be included.

Please note that our comments on each of the above projects are preliminary at this time and that our final position will be determined after our review of the Draft Environmental Impact Statement on each project. If you have any questions regarding our comments, please contact Ms. Barbara J. Taylor of my staff at 312-353-2307.

Sincerely yours,

*Barbara Jean Taylor for*  
Gary A. Williams  
Chief,  
Environmental Review Section

NATURAL RESOURCES COMMISSION

CARL T JOHNSON  
E M LAITALA  
DEAN PRICEDON  
HILARY F SNELL  
HARRY H WHITELEY  
JOAN L WOLFF  
CHARLES G YOUNGLOVE



WILLIAM G. MILLIKEN, Governor

DEPARTMENT OF NATURAL RESOURCES

HOWARD A. TANNER, Director

WATERWAYS COMMISSION

CHARLES A BOYER  
ARTHUR G ELLIOTT  
LEONARD J HEPPFEE  
VOLMAR J MILLER  
LEONARD H THOMAS

P O Box 30028  
Lansing, Michigan 48901

July 18, 1977

Serial No. 1283-77  
File No. B 11.45

Melvyn D. Remus, Colonel  
District Engineer  
Department of the Army  
Detroit District, Corps of Engineers  
Box 1027  
Detroit, Michigan 48231

Dear Colonel Remus:

Reference is made to recent correspondence and meetings regarding sites for the development of containment areas for the disposal of polluted dredged spoil.

At its meeting held June 16-17, 1977, the Michigan State Waterways Commission

RESOLVED, that it does hereby indicate its present ability and willingness to provide assurances to the U. S. Army, Corps of Engineers, for the following Spoil Containment projects pending receipt of the required assurances from the local units of government excepting Port Austin and the Inland Route, for which the State of Michigan shall provide the required items of local cooperation when and as required: Frankfort, Les Cheneaux, Inland Route, Harbor Beach, St. Joseph and Port Austin.

Such action was supported by the Natural Resources Commission at its meeting held July 14, 1977.

This action is based upon disposal sites for the various projects as follows:

- a. Frankfort - Filling of the BOR site and trucking excess material to state forest properties. As an alternate, utilize designated Luedke properties as an interim holding area with trucking of all dewatered materials to state forest properties.
- b. Les Cheneaux - Permanent containment at the Township dump, with utilization of an interim handling site at the golf course site, or lacking that capability, then development of an off-



WD-25-1

loading site at the Cedarville boat launching facility, which will be constructed as part of a state grant-in-aid project at Cedarville.

- c. Inland Route - An off-loading facility at the end of Snyder Road, with final containment on the east side of Snyder Road just south of Brutus Road on state forest properties.
- d. Harbor Beach - Utilization of City-owned park property at northern City limit, as an interim handling site with trucking of material to the Huron County-owned gravel pit.
- e. St. Joseph - Utilization of the Whirlpool Corporation properties as an interim handling site, with final disposal at Site 7 by truck delivery on the parcel of property which has been used as an industrial dump.
- f. Port Austin - Construction of a near-shore island facility east of the present recreational watercraft facilities with a causeway connection to permit public use of this island for recreational purposes upon completion.

Sincerely,



Keith Wilson, Chief  
Waterways Division

KW:RGL:db

cc: Dale Granger

17 JUL 1978

SEARCHED-ER

Ms. Elaine Breckelman  
Cheboygan County Commission  
County Building  
Cheboygan, Michigan 49721

Dear Ms. Breckelman,

Thank you for your comments regarding the Draft Environmental Statement, "Maintenance Dredging and Confined Disposal Facility for Michigan's Inland Route and the Operation, Maintenance, and Proposed Public Use Facilities for the Alanson Lock and Weir, Michigan". We appreciate you bringing to our attention information related to another disposal site alternative and possible public use for the materials to be dredged from the Crooked River.

The alternative which you suggested in your 25 April letter was considered during the formulation of this project. Several major factors, which are discussed below, made this alternative unacceptable.

During the selection process for a confined disposal site, it was determined that the area from the entrance of the Crooked River into Burt Lake to the State Forest is wetland. This represents a major environmental factor against its development. The site selection committee, which is made up of the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, Michigan Department of Natural Resources, and the Corps, agreed that the Snider Road site is acceptable as the confined disposal site.

The economic impact of your proposed plan would increase overall project costs. Additional funds would be required to pay for the increased disposal distance and the additional preparatory work necessary to get the site ready for disposal.

Finally, the Corps of Engineers responsibility is limited to the existing navigation course. The initial, as well as any future maintenance dredging of the Maple River could only be accomplished with Congressional approval. The existing authority and funds for maintenance of the Inland Route does not include the Maple River.

NCRED-ER  
Ms. Klaine Brockman

I hope we have satisfactorily addressed your concerns and comments regarding the Inland Route project. If you have any more questions, feel free to contact me.

Sincerely yours,

P. McCALLISTER  
Chief, Engineering Division

NCEED-T

19 MAY 1972

Miss Laverne Underwood  
Box 131  
Alanson, MI 49706

Dear Miss Underwood:

Thank you for your letter concerning the disposal project on the Inland Route. I would like to answer some of the questions raised in your letter.

When the workshop was held in Indian River on 8 December 1976, notices were placed in local post offices, printed in local newspapers and mailed to anyone whom we knew had an interest in the project. The purpose of the meeting was to provide information on what the Corps of Engineers needed in a disposal site to resume dredging of the Crooked River, and to receive suggestions from those more familiar with the area. The proposal to use the state land for disposal was first suggested at the meeting and later investigated.

Concerning your worry about surveys, before any work would be started, the area would be marked to insure that the work stayed within the road right-of-way. As the area would be used simply as a loading point for direct transfer into waiting trucks with no stockpiling or dumping on the sites, odor and mess would be kept to a minimum. If any problems were to arise, the contractor on the job would be required to return the area to its existing condition.

I hope this information has been of some help in answering your questions. It is our intention that the work be scheduled and conducted to create as little interference with local residents as possible.

Sincerely yours,

P. McCALLISTER  
Chief, Engineering Division



UNITED STATES  
ENVIRONMENTAL PROTECTION AGENCY  
REGION V  
230 SOUTH DEARBORN ST.  
CHICAGO, ILLINOIS 60604



DEC 10 1976

Colonel Melvin D. Remus  
District Engineer  
Detroit District, Corps of Engineers  
Box 1027  
Detroit, Michigan 48231

Dear Colonel Remus:

Reference is made to an August 2, 1976, request by the Michigan Department of Natural Resources for a determination of the eligibility for waiver of the 25 percent non-federal contribution for the contained dredge spoil disposal program at the Inland Route, Michigan.

Section 123(d) of Public Law 91-611 gives the authority to the Secretary of the Army to waive the required local cooperation when the U.S. Environmental Protection Agency finds that certain requirements are being met. The two requirements that must be fulfilled are:

1. Local entities must be participating in and in compliance with an approved plan for the general geographical area of the dredging activity for construction, modification, expansion, or rehabilitation of waste treatment facilities.
2. Applicable water quality standards are not being violated.

Since both requirements have been satisfied, we find that the local sponsor is eligible for the waiver of the 25 percent non-federal contribution towards construction costs of the dredge spoil disposal program for the Inland Route channels.

If we can be of further assistance, please do not hesitate to contact this office.

Sincerely yours,

Valdas V. Adamkus  
Deputy Regional Administrator

27 DEC 1976

NCEED-T

Dr. Howard A. Tanner  
Director, Dept. of Natural Resources  
Stevens T. Mason Building  
Lansing, MI 48926

Dear Dr. Tanner:

This concerns your 2 August 1976 request to the United States Environmental Protection Agency for a waiver of the 25 percent non-Federal contribution for the contained dredge spoil disposal program at the Inland Route, Michigan.

Paragraph (c) of Section 123 of the River and Harbor Act of 1970 (Public Law 91-611) requires the appropriate state or states, inter-state agency, municipality, or other appropriate political subdivision of the state to agree to contribute to the United States 25 percent of the construction costs prior to construction of a contained disposal facility. The Environmental Protection Agency has found that the Inland Route is participating in and in compliance with an approved plan for the geographical area of the dredging activity for construction, modification, expansion or rehabilitation of waste treatment facilities and applicable water quality standards are not being violated. Consequently, the Environmental Protection Agency has found the Inland Route eligible for a waiver from contribution to construction costs.

This is to inform you that I have reviewed the findings of the Environmental Protection Agency in this matter. By the provisions of paragraph (d), Public Law 91-611, under the authority of the Secretary

NCEED-T  
Dr. Howard A. Tanner

27 DEC 1970

of the Army, I do hereby grant a waiver of the obligation of non-Federal interests to contribute 25 percent of the construction costs of the proposed spoil disposal facility to be located at the Inland Route, Michigan.

Sincerely yours,

MELVYN D. REMUS  
Colonel, Corps of Engineers  
District Engineer

Copy Furnished:  
Mr. Dale Granger, Chief, Hydrological Division

14 SET

NCEED-FR

Regional Director  
Heritage Conservation and Recreation Service  
Federal Building  
Ann Arbor, MI 48107

Dear Sir:

For your information and comment, a copy of the Draft Environmental Statement on the "Maintenance Dredging and Confined Disposal Facility for Michigan's Inland Route and the Operation, Maintenance, and Proposed Public Use Facilities for the Alanson Lock and Weir" is inclosed. The proposed plan consists of removing shoaled material from the Crooked River and disposing of it in a diked area (see pages I-5 and I-6 of document). Construction of public use facilities at the Alanson Lock and Weir are also planned (see pages I-5 and I-12).

There are no known cultural resources in the proposed disposal site nor in the immediate vicinity of the lock and weir structures. The Michigan State Historic Preservation Officer was contacted and stated by letter (page D-2) that the project would have no effect on cultural resources.

Please analyze the inclosed document for any cultural properties that could be affected by the proposed project. We would greatly appreciate your early attention to this request.

Sincerely yours,

1 Incl  
As stated

P. McCALLISTER  
Chief, Engineering Division

83927

October 19, 1978

Colonel Melvyn D. Pava  
Detroit District, Corps of Engineers  
Box 1027  
Detroit, Michigan 48231

Dear Colonel Pava:

This responds to Mr. McCallister's letter dated September 15, 1978, in which comments were requested on the Draft environmental statement for improvements, operation, and maintenance of facilities at the Alanson Lock and Dam in Iosco County, Michigan.

Our review, based on information provided and our general knowledge of the area, has disclosed no potential adverse impacts on cultural resources or other environmental resources within our area of jurisdiction and expertise. These comments are fully consistent with those previously provided by the Department of the Interior in May 1978.

Sincerely yours,



John D. Cherry  
Regional Director

Carlson/cab

cc: David L. Jervis, Regional Environmental Officer  
Fish & Wildlife Service, North Central Region



UNITED STATES  
ENVIRONMENTAL PROTECTION AGENCY  
REGION V  
230 SOUTH DEARBORN ST.  
CHICAGO, ILLINOIS 60604

JUL 19 1978

Mr. P. McCallister  
Chief, Engineering Division  
Department of the Army  
Detroit District, Corps of Engineers  
Box 1027  
Detroit, Michigan 48231

Attn: Chief, Environmental Resources Branch

Dear Mr. McCallister:

We have completed our review of the Draft Environmental Impact Statements (EIS) for Maintenance Dredging and Confined Disposal Facility for Michigan's Inland Route and the Operation, Maintenance, and Proposed Public Use Facilities for the Alanson Lock and Weir which was sent to us with your letter of March 31, 1978. Based upon information presented in the Draft EIS and from our September, 1976, field visit of the area, we have no major objections to the proposed project but request additional information for a complete assessment. We offer the following comments:

The EIS indicated that water sources adjacent to the disposal site will be monitored to detect any detrimental impacts on water quality. A definitive monitoring program should be established before the project is begun stipulating who will be responsible for conducting the monitoring and reviewing the results, the frequency of monitoring, and what parameters will be tested. Both groundwater monitoring and monitoring in the vicinity of the transfer site should be included in the program. Parameters to be tested should include those which exceeded USEPA criteria for polluted sediment.

The specifics of disposal site runoff control should also be detailed in the Final EIS.

The area which will be used as a transfer site should be restored in a manner suitable for its designation as a scenic resources zoning district. The problem of leakage and spillage of spoil and water from the transport trucks should be addressed.

The Final EIS should chart the exact location of the proposed public use facilities so that impacts of construction and use on water quality could be more adequately evaluated.

The impact on the stream of maintaining a gravel surface on the proposed parking lot should be evaluated in addition to the black-top

surface suggested. Additionally, some sort of trap for runoff waters and sediment should be considered.

It should be noted that the implementation of best management practices to control surface runoff, being proposed by the 208 Agency in its water quality management plan, may reduce future sedimentation of the channel below the projected 1000 cy/yr accumulation.

As indicated in the above discussion and in accordance with EPA's procedures, we have classified our comments on the proposed project as LO, lack of objection, and rated the Draft EIS as Category 2, more information required. The date and classification of our comments will be published in the Federal Register.

Thank you for the opportunity to review the subject document. If you have any questions about our comments, please contact Ms. Barbara Taylor of my staff at 312-353-2307. Please send us two copies of the Final EIS when it is filed with the Council on Environmental Quality.

Sincerely,

*Barbara J. Taylor for*  
Susan P. Walker, Chief  
Environmental Impact Review Staff  
Office of Federal Activities

STATE OF MICHIGAN



NATURAL RESOURCES COMMISSION

CARL T JOHNSON  
E M LAITALA  
DEAN PRIDGEON  
HILARY F SNELL  
HARRY H WHITELEY  
JOAN L WOLFE  
CHARLES G YOUNGLOVE

WILLIAM G MILLIKEN, Governor

DEPARTMENT OF NATURAL RESOURCES

STEVENS T MASON BUILDING BOX 30028 LANSING MICHIGAN 48904  
HOWARD A TANNER Director

October 16, 1979

Mr. Phillip McCallister, Chief  
Engineering Division  
U.S. Corp of Engineers  
P.O. Box 1027  
Detroit, MI 48231

Re: Inland Route Project-Section 123  
Essexville Office Project-Section  
122

Dear Mr. McAllister:

Upon recommendation of the Corps Project Review Committee, the State of Michigan certifies under Section 401(a) of the Federal Water Pollution Control Act, as amended, P.L. 95-217, that the above projects will comply with the State's water quality standards. Additionally, this document will serve as a State of Michigan concurrence for the work and fulfill the requirements of Section 404(T) of the Federal Act.

Sincerely,

WATER QUALITY DIVISION

*R. J. Courchaine*  
R. J. Courchaine  
Division Chief

RJC/JB/ej  
cc: L. Witte, Chairman  
Committee Members



R1026 10-76

APPENDIX E  
COMMENTS TO THE  
DRAFT ENVIRONMENTAL STATEMENT



DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE  
PUBLIC HEALTH SERVICE  
CENTER FOR DISEASE CONTROL  
ATLANTA, GEORGIA 30333

May 9, 1978

U.S. Army Engineer District, Detroit  
ATTN: Chief, Environmental Resources Branch  
P. O. Box 1027  
Detroit, Michigan 48231

Dear Sir:

We have reviewed the draft environmental statement on Maintenance Dredging and Confined Disposal Facility for Michigan's Inland Route and The Operation, Maintenance, and Proposed Public Use Facilities for the Alanson Lock and Weir, Michigan, for vectorborne disease impacts. We are responding on behalf of the Public Health Service.

Mosquito problems are not mentioned as a possible result of the dredged material disposal. However, dredged material disposal sites are recognized as sources of Aedes sollicitans and other salt marsh species along the Gulf and Atlantic coasts, and complicate mosquito control efforts in those regions.

Since we are presently unsure of the contribution of spoils disposal sites in Michigan (or other north central areas) to vector mosquito problems, it would seem appropriate that the Michigan State Department of Health be contacted in this regard.

Thank you for the opportunity to review this statement.

Sincerely yours,

A handwritten signature in black ink, appearing to read "W.H. Foege".

William H. Foege, M.D.  
Assistant Surgeon General  
Director

FEDERAL ENERGY REGULATORY COMMISSION

REGIONAL OFFICE

Federal Building - Room 3130  
230 South Dearborn Street  
Chicago, Illinois 60604

May 1, 1978

YOUR REFERENCE:  
NCEED-ER

District Engineer  
Department of the Army  
Detroit District, Corps of Engineers  
Box 1027  
Detroit, Michigan 48231

Attn: Chief, Environmental Resources Branch

Dear Sir:

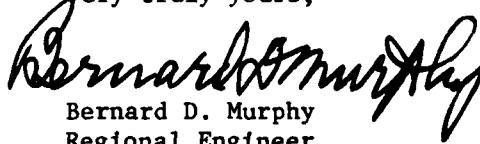
We have reviewed the Draft Environmental Statement dated March 31, 1978 for Alanson Lock and Weir, Michigan for which our comments were requested.

Comments of this office are made in accordance with the National Environmental Policy Act of 1969 and the August 1, 1973 Guidelines of the Council on Environmental Quality. Our principal concern with developments affecting land and water resources is the possible effect of such developments on bulk electric power facilities including potential hydroelectric developments and on natural gas pipeline facilities.

Since the proposed project apparently would pose no major obstacle to the construction and operation of such facilities, we have no comments on the Draft Environmental Statement.

Thank you for the opportunity to comment on the Draft Environmental Statement.

Very truly yours,

  
Bernard D. Murphy  
Regional Engineer

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE, 1405 SOUTH HARRISON ROAD, ROOM 101, EAST LANSING, MICHIGAN 48823

May 19, 1978

U.S. Army Engineer District, Detroit  
Attention: Chief, Environmental Resources Branch  
P.O. Box 1027  
Detroit, Michigan 48231

Dear Sir:

We have reviewed the draft environmental statement and letter report concerning the maintenance dredging and confined disposal facility for Michigan's inland route operation and maintenance and proposed facilities for the Alanson Lock and Weir. We have no comments to make.

Sincerely,



Arthur H. Cratty  
State Conservationist

cc: R. M. Davis, Administrator, SCS, Washington, D.C.  
Director, Office of Federal Activities, Environmental Protection  
Agency, Room 537, West Tower, 401 M. Street S.W., Washington,  
D.C. 20460 - 5 copies

AHC:dlm:gla 1164A



UNITED STATES DEPARTMENT OF AGRICULTURE  
FOREST SERVICE  
NORTHEASTERN AREA STATE AND PRIVATE FORESTRY  
370 REED ROAD - BROOMALL, PA. 19008  
(215) 596-1672

1950  
May 11, 1978



Colonel Melvyn D. Remus  
U. S. Army Engineer District, Detroit  
P. O. Box 1027  
Detroit, MI 48231

Refer to: Draft Environmental Statement  
Dredging & Disposal & Alanson  
Lock and Weir, MI

Dear Colonel Remus:

To minimize the bare appearance of the disposal site a few trees could be retained, or planted at the borders of the dredge disposal site; and, at the completion of disposal, trees should be planted on the spoil.

Thank you for the opportunity to review this Statement.

Sincerely,

*Dale O. Vandenburg*  
for Dale O. VANDENBURG  
Staff Director  
Environmental Quality Evaluation



**UNITED STATES DEPARTMENT OF COMMERCE**  
**The Assistant Secretary for Policy**  
Washington, D.C. 20230

May 5, 1978

U.S. Army Engineer District, Detroit  
P.O. Box 1027  
Detroit, Michigan 48321

ATTENTION: Chief, Environmental Resources Branch

To Whom It May Concern:

We recently received a copy of the Draft Environmental Statement and Letter Report for Dredged Material Disposal Area, Inland Route, Michigan.

In the future for field review of studies, reports, surveys etc., please send six (6) copies to the Department of Commerce's Secretarial Representative in the appropriate Federal region. In this instance, the Detailed Project Report has been sent to:

Loren A. Wittner  
CNA Building  
55 East Jackson Blvd.  
Room 1402  
Chicago, Illinois 60604

The Secretarial Representative in the region will arrange for the studies to be distributed to the appropriate Commerce Field Office for review, and the Representative will consolidate the field comments in a reply to you.

Please continue to send all copies of the environmental impact statement along with two (2) copies of the main report and any appendices to the following address:

Dr. Sidney R. Galler  
Deputy Assistant Secretary  
for Environmental Affairs  
U.S. Department of Commerce  
Washington, D.C. 20230

Dr. Galler will see that the environmental impact statement is reviewed, and he will reply to you directly.

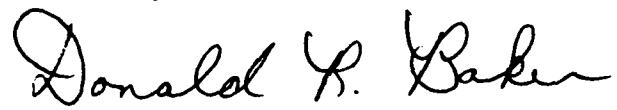


-2-

When the feasibility report, survey, etc. and its environmental impact statement are bound under one cover and you want a review of each, then send six (6) copies of the report with the environmental statement to each reviewer, that is to the Secretarial Representative and to Dr. Galler.

Thank you for the opportunity you have given us to review and comment on this report and statement.

Sincerely,



Donald R. Baker  
Water Resources Coordinator



**UNITED STATES DEPARTMENT OF COMMERCE  
The Assistant Secretary for Science and Technology  
Washington, D.C. 20230  
(202) 377-3111**

May 23, 1978

U.S. Army Engineer District, Detroit  
P.O. Box 1027  
Detroit, Michigan 48321

**Attention: Chief, Environmental Resources Branch**

Dear Sir:

This is in reference to your draft environmental impact statement and letter report entitled "Maintenance Dredging and Confined Disposal Facility for Michigan's Inland Route and the Operation, Maintenance, and Proposed Public Use Facilities for the Alanson Lock and Weir, Michigan". The enclosed comments from the National Oceanic and Atmospheric Administration are forwarded for your consideration.

Thank you for giving us an opportunity to provide these comments, which we hope will be of assistance to you. We would appreciate receiving eight copies of the final statement.

Sincerely,

A handwritten signature in cursive ink that appears to read "Sidney R. Galter".

Sidney R. Galter  
Deputy Assistant Secretary  
for Environmental Affairs

Enclosures: Memo from  
NOAA-Great Lakes Environmental  
Laboratory and;  
NOAA-National Ocean Survey



**U.S. DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
ENVIRONMENTAL RESEARCH LABORATORIES**

Great Lakes Environmental Research Laboratory  
2300 Washtenaw Avenue  
Ann Arbor, Michigan 48104

May 16, 1978

**MAY 18 1978**

TO : Dr. William Aron  
Director, Office of Ecology and Conservation, EC  
*CDW*

FROM : Dr. Eugene J. Aubert  
Director, GLERL, RF24

SUBJECT: DEIS 7804.30 - Alanson Lock and Weir, Michigan

The subject DEIS prepared by the Corps of Engineers, Detroit District, on maintenance of Alanson Lock and Weir and on dredging in Crooked River, Michigan has been reviewed and comments herewith submitted.

There are no objections to maintenance dredging in the Crooked River of Inland Route and disposal of polluted spoil in a confined area on land of Hardwood State Forest. Dredging in Crooked River and maintenance of Alanson Lock and Weir will have insignificant effect on the adjoining lakes Crooked and Burt.

It appears that disposal of any dredge spoil, polluted or clean, should not be considered in smaller inland lakes.





**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
NATIONAL OCEAN SURVEY  
Rockville, Md. 20852

C52/JLR

MAY 19 1978

MAY 22 1978

TO: William Aron  
Director  
Office of Ecology and Environmental Conservation  
*Gordon Lill*  
FROM: Gordon Lill  
Deputy Director  
National Ocean Survey  
  
SUBJECT: DEIS #7804.30 - Alanson Lock and Weir, Michigan

The subject statement has been reviewed within the areas of NOS responsibility and expertise, and in terms of the impact of the proposed action on NOS activities and projects.

The following comment is offered for your consideration.

Although NOS maintains water level monitoring gages in the Great Lakes System, it does not in Michigan's Inland Route. Therefore, we are unable to support or refute specific values. However, in reviewing the statement, we find no objection to the proposed maintenance dredging, disposal facility, and operation of the Alanson Lock.





## United States Department of the Interior

OFFICE OF THE SECRETARY  
NORTH CENTRAL REGION  
2510 DEMPSTER STREET  
DES PLAINES, ILLINOIS 60016

ER 78/340

May 25, 1978

Colonel Melvyn D. Remus  
District Engineer  
U.S. Army Engineer District  
Attn: Chief, Environmental Resources Branch  
P.O. Box 1027  
Detroit, Michigan 48231

Dear Colonel Remus:

We have reviewed the Draft Environmental Statement and Letter Report for Maintenance Dredging, Alanson Lock and Weir in Michigan, and are providing the following comments:

Measures such as silt screens should be considered during dredging to control the downstream migration of materials that contain toxic substances (EIS page I-12, section D).

The frequency, magnitude, and depth of flooding on Maple River within the project area should be considered. Such data would be helpful to evaluate any adverse effects of flooding on the structural integrity of the dredged-material disposal site.

The hydraulic gradient used in calculating the rate of movement of nitrates from the disposal area to the nearest surface water (EIS page V-4) should be included in the statement, or water-table contours should be shown. The statement should also include at least typical depths to water in the shallow unconfined zone and in the confined aquifer. One or more logs of wells in the project vicinity that tap the confined aquifer would aid in impact appraisal. At least a limited amount of periodic ground-water monitoring should be considered; if this is to be accomplished by a state or other government agency, this fact should be mentioned.

We believe that a misunderstanding of the Fish and Wildlife Service's (FWS) position relative to one of the alternative disposal sites should be corrected. On page VI-4, paragraph 6.09, the EIS incorrectly states that FWS agreed to accept the Michigan Department of Natural Resources' (DNR)

borrow pit site located one-half mile west-northwest of Maple Bay Forest Campground. In a letter dated February 23, 1977 (see page D-3), the Fish and Wildlife Service stated that the DNR borrow pit south of Brutus Road, corresponding with Site 4 in the statement, would not be approved until after a field investigation could be made. The field investigation was not accomplished. Therefore, the Fish and Wildlife Service never approved this site.

Sincerely yours,



David L. Jervis  
Regional Environmental Officer



U.S. DEPARTMENT OF TRANSPORTATION  
FEDERAL HIGHWAY ADMINISTRATION  
REGION 5  
18209 DIXIE HIGHWAY  
HOMEWOOD ILLINOIS 60430  
May 8, 1978

IN REPLY REFER TO

HED-05

U. S. Army Engineer District, Detroit  
P.O. Box 1027  
Detroit, Michigan 48231

ATTN: Chief, Environmental Resources Branch

Dear Sirs:

The draft environmental statement for maintenance dredging and confined disposal facility for Michigan's Inland Route and the operations, maintenance, and proposed public use facilities for the Alanson Lock and Weir, Michigan has been reviewed and we have no comments to offer on the statement.

Sincerely yours,

Donald E. Trull  
Regional Administrator

A handwritten signature in black ink that appears to read "W.E. Trull".

By:

W. G. Emrich, Director  
Office of Environment and Design

STATE OF MICHIGAN



NATURAL RESOURCES COMMISSION

CARL T. JOHNSON  
E. M. LAITALA  
DEAN PRIGEON  
HILARY F. SNELL  
HARRY H. WHITELEY  
JOAN L. WOLFE  
CHARLES G. YOUNGLOVE

WILLIAM G. MILLIKEN, Governor

**DEPARTMENT OF NATURAL RESOURCES**

STEVENS T. MASON BUILDING, BOX 30028, LANSING, MICHIGAN 48909

HOWARD A. TANNER, Director

May 22, 1978

U.S. Army Engineer District, Detroit  
P. O. Box 1027  
Detroit, Michigan 48231

Attention: Chief, Environmental Resources Branch

Gentlemen:

The Department of Natural Resources has reviewed your proposed Maintenance Operations and Dredged Material Disposal for Alanson Lock and Weir and for the Inland Route, and have the following comments for your attention.

Concern has been expressed regarding the disposal procedures for sediments acceptable for "open water" disposal. Presently, these sediments are placed on waterfront lands or dumped in open water. Do waterfront lands include wetland areas or lands below the ordinary high water mark? What actions are taken to prevent erosion of deposited material and the leaching of plant nutrients back into the water system? Does "open water" disposal include inland lake waters? These questions should be addressed in the environmental statement.

The report identifies soil stabilization for the finished product but says nothing about preventative measures that will be followed during construction. This should be established when a permit is obtained from the Emmet County Enforcing Agency.

In reference to Section IV, page 5, paragraph 4.22, sentence 5, fish perhaps do not instinctively avoid high turbid or low DO areas. Movements may depend on size of fish, species of fish, or whether entrapment occurs, i.e., if the fish is caught in a situation from which he has no escape route. Evidence is available to show that certain fish penetrate areas of turbidity and low DO, indicating that the avoidance instinct is questionable.



R1026 10/76

U. S. Army Engineer District, Detroit  
May 22, 1978  
Page 2

This may become a problem due to the effects of the high concentrations of COD (150,000 mg/kg dry weight, average) on the areas downstream from the dredging operation. Calculations indicate that moderately high oxygen demand will result in this system from the COD dredged from the sediments. Should these values exceed 5 mg/kg, dissolved oxygen in the system will be severely reduced below the dredging operation which could result in fish kills.

It is, therefore, recommended that the Corps establish a station upstream from the dredging operation as a control and a station within the next mile downstream from the dredging operation and monitor dissolved oxygen concentrations on a daily basis for at least the first 21 days of operation.

Sincerely,  
  
Howard A. Tanner  
Director

STATE OF MICHIGAN



HIGHWAY COMMISSION

PETER B. FLETCHER

CHAIRMAN

Ypsilanti

CARL V. PELLONPAA

VICE CHAIRMAN

Ishpeming

HANNES MEYERS, JR.

COMMISSIONER

Zeeland

WESTON E. VIVIAN

COMMISSIONER

Ann Arbor

WILLIAM G. MILLIKEN, GOVERNOR

DEPARTMENT OF STATE HIGHWAYS AND TRANSPORTATION

STATE HIGHWAYS BUILDING, 425 WEST OTTAWA PHONE 517-373-2090  
POST OFFICE BOX 30050, LANSING, MICHIGAN 48909

JOHN P. WOODFORD, DIRECTOR

May 12, 1978

Mr. P. McCallister, Chief  
Engineering Division  
Department of the Army  
Detroit District, Corps of Engineers  
P. O. Box 1027  
Detroit, Michigan 48231

Dear Mr. McCallister:

The Environmental Liaison Section has reviewed the Draft Environmental Statement for the Maintenance Dredging and Confined Disposal Facility for Michigan's Inland Route and the Operation, Maintenance and Proposed Public Use Facilities for the Alanson Lock and Weir.

The Statement describes the impacts of the dredging operation in detail and is generally adequate in the description of impacts from the disposal of dredge materials. We concur with your selection of the transfer and disposal site. We do feel, however, that more detail is needed in the discussion of impacts associated with the public use facilities. We wish to offer the following comments:

- 1) An unnamed creek flows into the Crooked River in the vicinity of the transfer site. It has been designated as a trout stream by the Michigan Department of Natural Resources. No mention of it was made in the Statement. If the creek is far enough from the site to ensure that it will not be affected by construction activities, or the loading of dredge materials, then this should be stated. It appears, however, that because of the proximity of the creek to the transfer site, some impacts might occur during and after construction from loading activities. If this is the case, these impacts should be addressed in the Statement.
- 2) The potential for sedimentation into Crooked River is high during construction of the transfer site because of the fill material being placed on the river bank. Every effort should be taken to ensure that the fill material will not enter the river during construction.



Mr. P. McCallister  
May 12, 1978  
Page 2

- 3) Paragraph 4.36 on page IV-8 states that "the grove of cedar trees on which the proposed trail is to be placed is small, and impacts to ground, river, storm and flood waters, as a result of the proposed action should be minimal." Does this mean the entire grove will be removed, or just a portion of it? If the entire grove is to be removed, what is its size? Is the 900 square feet to be filled with woodchips the entire grove, or part of it? These points should be clarified.
- 4) Part E of Section IV which described the impacts of construction of the Public Use Facilities does not describe the impacts from construction of the parking lot and storage building. How much vegetation will be removed, and how will this affect the terrestrial and aquatic environment? Will any fill material be required?

Thank you for the opportunity to comment on this Statement.

Sincerely,



Jan H. Raad, Manager  
Environmental Liaison Section  
Environmental and Community  
Factors Division

MICHIGAN STATE UNIVERSITY

THE MUSEUM

EAST LANSING • MICHIGAN • 48824

P. McCallister  
Chief, Engineering Division  
Department of the Army  
Detroit District, Corps of Engineers  
Box 1027  
Detroit, MI 48231

24 April 1978

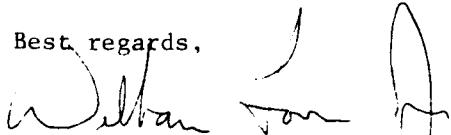
Dear Sir:

I have had the opportunity to review the Draft Environmental Statement titled Maintenance Dredging and Confined Disposal Facility for Michigan's Inland Route, and the Operation Maintenance and Proposed Public Use Facilities for the Alanson Lock and Weir, Michigan. This has been evaluated with respect to the archaeological impacts of the proposed actions, Section IIN, pages II-23-24.

Although you are correct in indicating that no adverse impacts to archaeological sites should result from the project, Section 2.61 contains several substantive errors. Among these are that five archaeological sites exist within a one mile radius of the Alanson Lock and Weir, but that the project area itself has been surface surveyed by Michigan State University and no surface indications of sites were noticed. In addition, three archaeological sites occur within a one mile radius of the transfer site and disposal site on the Crooked River. The transfer site possessed no surface indications of archaeological materials. In summary, eight archaeological sites could have been affected by the proposed actions. However, two of the three project areas have received surface reconnaissance, while the disposal site is in a low potential area based upon survey in similar environmental situations.

Thank you for the opportunity to comment on these proposed projects.

Best regards,



William A. Lovis, Ph.D.  
Curator of Great Lakes Archaeology  
Secretary, Conference on Michigan Archaeology

WL:cm

April 25, 1978

U. S. Army Engineer District, Detroit  
Corps of Engineers  
P. O. Box 1027  
Detroit, Michigan 48231

Attn: Chief, Environmental Resources Branch

Subject: Draft Environmental Statement Re-Alanson Lock  
and Weir and Dredged Material Disposal Area.

Gentlemen:

We, the undersigned, as representatives of the Cheboygan County Commission indicated, do hereby register our formal protest against the location and construction of an off loading facility at the end of Snider Road - as contrasted to a more beneficial location of an off loading facility - that would provide for multiple purpose uses for years to come - and thereby return taxpayers a much greater value for their dollars.

We quote from a March 1, 1977, letter by Howard A. Tanner, D.N.R. Director, as follows:

"As Michigan's new law for erosion and sedimentation control continues to unfold, its value becomes more obvious. The number of cities, villages, and charter townships and 83 counties now participating in this local-state environmental preservation effort are proving that much can still be accomplished. No doubt, much damage to state waters has already taken place through thoughtless and careless urban and rural earth changing activities, yet protective progress can still be made. Michigan still provides some of the finest recreational waters in the country and accordingly must take great strides forward in protection. Act 347 of 1972 will serve to assist in reaching this goal."

Our proposal is that of constructing the off loading facility at the mouth of Maple River on the south end of the sand bar between Maple River and Forest Camp Ground.

This location for an off loading facility would result in its use for multiple purposes such as:

Sand sediment pollution from Maple River is slowly filling Maple Bay. The dredging of this sand sediment, to provide for dredge channels, could be used in the construction of the off loading facility. There would be an abundance of sand sediment to build up the sand bar for a truck road. Properly engineered, the banks of the truck road would provide a 2,000 ft. long public beach. In addition, an athletic field of fill and sediment would be a much welcomed and needed recreation facility to the Forest Camp Ground.

U. S. Army Engineer District, Detroit  
Attn: Chief, Environmental Resources Branch

April 25, 1978  
Page 2

An expanded beach and athletic field to the south of Forest Camp Ground would bring much needed relief to the home owners adjacent to the Forest Camp Ground who currently share their beaches with the public.

One more very important use to be gained - Dredging at the mouth of the Maple River will keep the river open in both high and low water years so that fish spawning is not interrupted.

Our proposal to locate the off loading facility in the area of the mouth of the Maple River would not require the relocation of a disposal facility other than the Snider Road location that has been selected.

Briefly, our proposal recognizes:

- 1) Act 347 of 1972 and the need for a better environment through soil erosion and sedimentation control.
- 2) The responsibility of the Cheboygan County Parks and Recreation Commission to plan and act for the future. (The development of residential lake-shore property is making our job of providing public beaches very difficult. A 2,000 foot public beach would be most welcome.)
- 3) Not only safeguard the environment and plan for future recreation, but in so doing make certain that the tax-payers' money is invested wisely.

Sincerely,

*Don Freeland*

Don Freeland, President  
Cheboygan County  
Parks & Recreation Commission

*Leona Stillwell*

Leona Stillwell, Secretary  
Cheboygan County  
Parks & Recreation Commission

*Charles E. Bonnett*

Charles E. Bonnett, Chairman  
Cheboygan Soil Conservation District

*Ralph H. Hemmer*

Ralph Hemmer, Chairman  
Cheboygan River & Water Courses

*Edward A. Erickson*  
Edward A. Erickson  
Cheboygan County Drain Commissioner

## CHEBOYGAN COUNTY

**OFFICE OF COUNTY CLERK**

JOANNE C. SPRAY

CHEBOYGAN MICHIGAN 49721  
PHONE 616-627-4233

May 12, 1978

TO WHOM IT MAY CONCERN:

Please be advised of the following action taken by the Cheboygan County Board of Commissioners at a regular meeting held May 9, 1978

Motion by Commissioner Vincent, supported by Commissioner Hemmer, that the Cheboygan County Board of Commissioners go on record in support of the proposed construction of an off loading facility at the mouth of Maple River on the south end of the sand bar between Maple River and Forest Camp Ground as proposed by the Cheboygan County Parks & Recreation Commission, the Cheboygan County Soil Conservation District and the Cheboygan County Drain Commissioner.

Carried unanimously.

**STATE OF MICHIGAN**

ss

**COUNTY OF CHEBOYGAN**

I, Joanne C. Spray, Clerk of the Board of County Commissioners for the County of Cheboygan do hereby certify that the above is a true and correct copy of a motion passed by the Cheboygan County Board of Commissioners in a regular session on Tuesday, May 9, 1978. That I have compared the same with the original, and it is a true transcript therefrom and of the whole thereof.

IN TESTIMONY THEREOF, I have hereunto set my hand and affixed the official seal of the Circuit Court at Cheboygan, Michigan this 12th day of May A.D. 1978.

Joanne C. Spray  
Joanne C. Spray, Clerk of the Cheboygan  
County Board of Commissioners

April 25, 1978

Dear Sir:

In regard to your proposed transfer site for dredged material on the I-nland Route, I have a few questions and gripes. I own the residence on the end of Snider road and am a year round resident. Why weren't the ones so closely associated with this project notified of the meeting you had?

My main concern is I think the corner stakes on the river should be surveyed. Before the new roadbed was installed I knew where the corner stake was on my corner. The road south from Devil's Elbow Drive jogs West & is mostly on my property. I would like to see this area surveyed & moved in an easterly direction to give me more of a buffer zone. The odor, noise and congestion will be bad enough as it is. Also my lawn area is lower than the road bed so feel will have a lot of spillage and mess on my area.

Also feel the County should be asked to clean & lower ditches on Devil's Elbow Drive where they connect with Snider Rd. before your project as it is standing stagnant water standing year round & very mosquito infested. If done after it will cause more soil to flow from creek into river & disrupt navigation.

Would appreciate hearing from you on this project either by phone or mail. My phone is 616-529-6315.

Sincerely,

Laverne Underwood

Box 131

Alanson, Mi.



NCEED-T

DEPARTMENT OF THE ARMY  
DETROIT DISTRICT, CORPS OF ENGINEERS  
BOX 1027  
DETROIT, MICHIGAN 48231

25 NOV 1977

PUBLIC NOTICE

DOCKING FACILITY, EMMET COUNTY, MICHIGAN

1. The U.S. Army Corps of Engineers proposes to construct a docking facility on the Crooked River in Emmett County, Michigan. The purpose of circulating this notice is to provide the public and any interested agency an additional opportunity to provide comments on the proposed work.
2. Project documents, consisting of a Letter Report and Environmental Impact Statement (EIS) will be reviewed in accordance with the following laws: Federal Water Pollution Control Act of 1972, Coastal Zone Management Act of 1972, National Environmental Policy Act of 1969, Fish and Wildlife Act of 1956, Fish and Wildlife Coordination Act, Endangered Species Act of 1973, National Historic Preservation Act of 1966, as well as the various Congressional Acts authorizing construction and maintenance of the Federal project.
3. The proposed plan calls for the placement of 35 stone filled gabions, 1' by 3' by 9', and two mooring posts at the Northern junction of Snider Road and the Crooked River. Approximately 950 square feet of riverbank would be covered. The facility will be used for the transfer of material dredged from the Crooked River to an upland disposal site.
4. The Letter Report and Environmental Impact Statement will be coordinated with the following agencies: U.S. Fish & Wildlife Service, U.S. Environmental Protection Agency, Michigan Department of Natural Resources, Advisory Council on Historic Preservation, U.S. Department of Commerce, U.S. Department of Transportation, Emmett County, and all known interested organizations and concerned citizens. In addition, a public workshop was held during the site selection process.
5. The transfer site is located on the right-of-way of Snider Road. Property adjacent to the site is mostly forested but some land has been partially cleared to accommodate homes. There are four homes within view of the proposed transfer sites, the nearest being approximately 15 yards from the site. Approximately 20 homes have been built in clearings along the Crooked River to the east of the proposed transfer site.
6. The proposed disposal site is located in a cleared area surrounded by aspen forest on property owned by the Michigan DNR. Adjacent private property is comprised of aspen forest and pasture lands. The U.S.

NCEEP-T

6 JUN 1977

Environmental Protection Agency has indicated its support of the proposed disposal site pending review of the EIS.

7. A Draft Environmental Impact Statement and Letter Report will be available in February 1978. Copies of the reports will be distributed for comments to all known interested parties.

8. Any person who has an interest which may be affected by the placement of gabions on the riverbank, may request a public hearing. The request must be submitted in writing to the District Engineer within thirty (30) days of the date of this notice and must clearly set forth the interest which may be affected and the manner in which the interest may be affected by this activity.

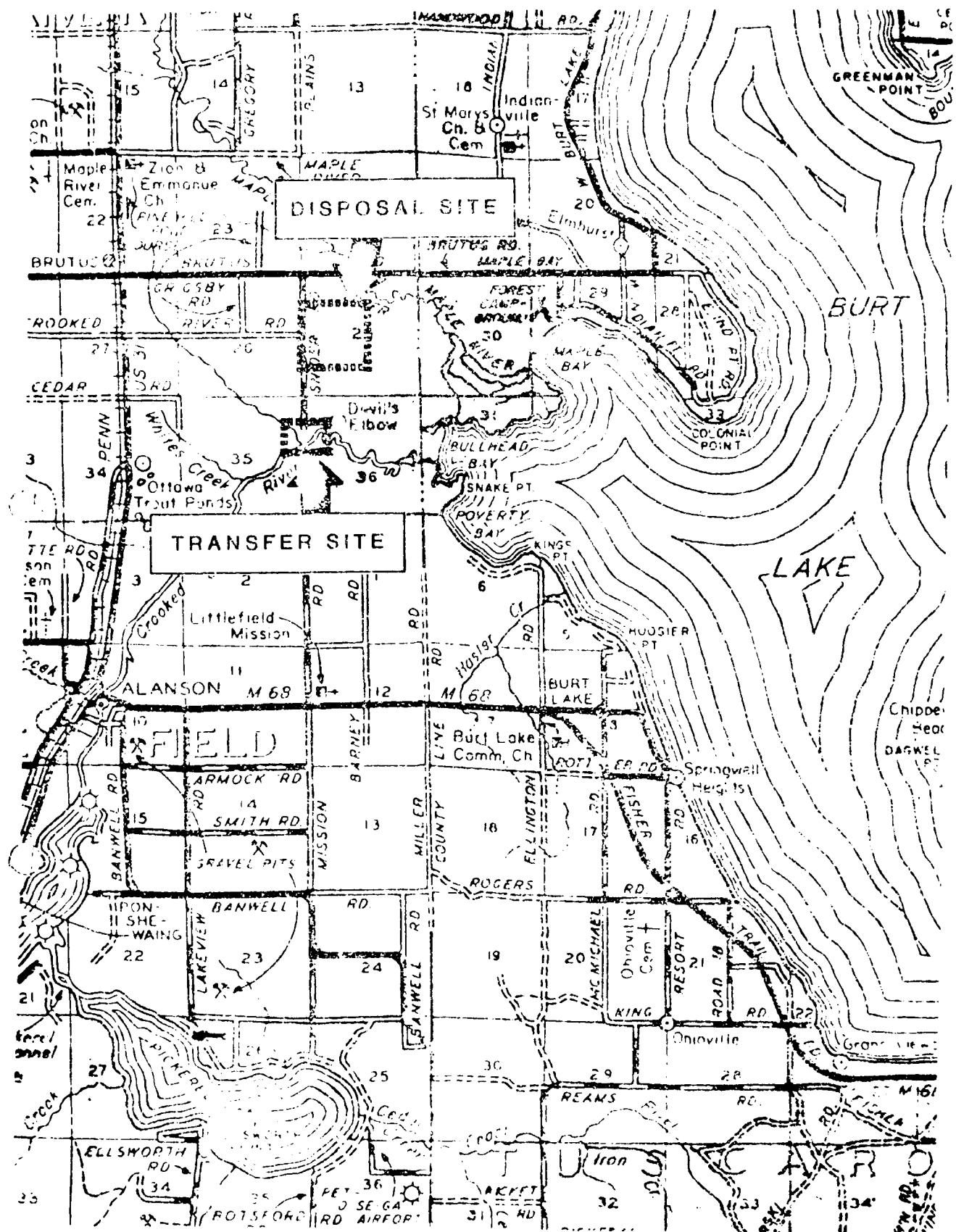
9. This notice is being published in conformance with 33 US Code of Federal Regulations 209.145. Any interested parties desiring to express their views concerning the proposed placement of gabions, may do so by filing their comments in writing with this office not later than 4:30 P.M., 30 days from the date of issuance of this notice.

1 Incl  
as

MELVYN D. REMUS  
Colonel, Corps of Engineers  
District Engineer

**Notice to Postmasters:**

It is requested that the above notice be conspicuously and continuously posted for 30 days from the date of issuance of this notice.





# United States Department of the Interior

FISH AND WILDLIFE SERVICE

IN REPLY REFER TO:

Federal Building, Fort Snelling  
Twin Cities, Minnesota 55111

AFA-SE

Colonel Robert V. Vermillion  
District Engineer  
U. S. Army Engineer District  
Detroit  
P. O. Box 1027  
Detroit, MI 48231

DEC 27 1979

Dear Colonel Vermillion:

This is in response to your letter of December 14, 1979 (NCEED-ER) regarding maintenance dredging in Crooked Lake and the Crooked River and Pickerel Lake portion of the Inland Route in Emmet and Cheboygan Counties, Michigan. The project also involves construction of a dredged material transfer facility off Snyder Road at the Crooked River and the continued operation and maintenance of the Crooked River Lock and Weir at Alanson, including construction of a parking lot, restroom facilities, storage building, observation platform, and a docking area for maintenance boats.

You are correct in stating that the Bald Eagle (Haliaeetus leucocephalus) is the only threatened or endangered species listed for Emmet or Cheboygan Counties. The exact location of the eagle nest in the project area is not known. However, if it is, in fact, located 1/2 mile from the project area, we agree with your conclusion that the project should not adversely affect the eagles. The only restriction that we can recommend to prevent undue disturbance is to prohibit construction and dredging activities between February 1 and July 31.

Mr. Len Schumann of our East Lansing office will attempt to locate the nest during this coming winter. If the nest is located substantially closer than 1/2 mile to the project area, additional restrictions may have to be imposed.

This letter provides comment only on the endangered species aspect of the project. Comments on other aspects of the project under the authority of and in accordance with the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et. seq.) may be sent under separate cover.

Sincerely yours,

Harvey K. Nelson  
Regional Director

**APPENDIX F**  
**VESSEL LENGTH TO DRAFT**  
**COMPARISON DATA**

## AT SPECIFICATIONS

Length (feet)	Beam (feet)	Draft		Freeboard		Max. Height Above Waterline
		For	Aft	For	Aft	
12' 0"	3' 6"	-	6' 9"			
15	4' 6"	-	7' 0"	0' 8"	-	2' 8"
16	4' 5"	-	7' 11"	0' 6"	-	3' 7"
17	5' 11"	-	7' 8"	0' 5"	-	3' 4"
18	5' 10"	-	9' 0"	0' 3"	-	3' 10"
19	6' 0"	-	8' 6"	0' 7"	-	2' 1"
20	5' 10"	-	8' 1"	0' 3"	-	3' 8"
21	7' 3"	-	9' 4"	0' 9"	-	3' 0"
22	7' 2"	-	0' 6"	1' 4"	-	2' 4"
23	7' 5"	-	9' 6"	0' 8"	-	2' 6"
24	7' 10"	-	0' 7"	0' 7"	-	2' 4"
25	8' 0"	-	9' 11"	1' 6"	-	2' 8"
26	8' 0"	-	10' 6"	0' 10"	-	2' 6"
27	8' 7"	-	10' 10"	1' 9"	-	2' 8"
28	9' 0"	-	12' 5"	1' 11"	-	2' 8"
29	9' 0"	-	11' 6"	1' 4"	-	3' 0"
30	9' 9"	-	11' 7"	1' 1' 3/4	-	2' 6"
				4' 1"	-	4' 1&1/2"
				2' 11&1/2"	-	3' 7"
				3' 0"	-	3' 4"
				3' 11&1/2"	-	8' 3&1/2"
				3' 0"	-	3' 7"
				2' 11&1/2"	-	4' 1&1/2"
				1' 8&1/2"	-	4' 5"
				3' 11&1/2"	-	8' 3&1/2"
				4' 10"	-	3' 4"
				4' 1"	-	4' 1&1/2"
				2' 11&1/2"	-	10' 5"

PLEASURE BOAT DRAFT (APPROX.)

<u>LENGTH OF BOAT (FT.)</u>	<u>DRAFT (INCHES)</u>		
	<u>INBOARD</u>	<u>OUTBOARD</u>	<u>SAILBOAT</u>
14	24	13	45
16	26	14	48
18	27	16	50
20	28	17	53
22	31	18	55
24	32	20	57
26	34	21	59
28	35	22	61
30	36	24	63
32	37	25	64
40	39		66
45	42		69
50	45		72
55	48		74
60	51		76
65	53		78
70	56		81
75	58		82
80	61		83
85	64		85
90	66		86
	69		88

**APPENDIX G**  
**ECONOMIC SUMMARY**

ECONOMIC DATA, EXTRACTED FROM  
 U.S. ARMY CORPS OF ENGINEERS  
 LETTER REPORT

INLAND ROUTE, MICHIGAN  
 27 MARCH 1978

<u>Description</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Estimated Amount</u>
<b>Transfer Facility Construction</b>				
Mooring Posts	2	Ea @	\$2,000.00	\$ 4,000.00
Compacted Sand Fill	100	Cy @	13.00	1,300.00
Stone Filled Gabions	35	Ea @	100.00	3,500.00
Dredging	100	Cy @	10.00	1,000.00
<b>Disposal Site Construction</b>				
Clearing and Grubbing	3	Ac @	3,000.00	9,000.00
Earthwork	10	Ac @	2,500.00	25,000.00
Seeding	1	Ac @	2,000.00	2,000.00
<b>Subtotal</b>				<b>\$ 45,800.00</b>
Contingency (20%)				9,200.00
Engineering and Design				119,000.00
Supervision and Administration (8%)				4,000.00
<b>Total Project Cost</b>				<b>\$178,000.00</b>

ADDITIONAL ANNUAL COST FOR THE  
 CONFINED DISPOSAL FACILITY

Total Project Cost	\$178,000
Annual Charges	
Interest @ 6-5/8%	11,800
Amortization for 10 years @ 0.07367	13,100
Operation & Maintenance*	6,000
Total	\$ 30,900

\*Includes, seeding and tilling after future dredgings.

## SUMMARIZED COST ESTIMATE FOR THE PUBLIC

## USE FACILITIES\*

<u>Item</u>	<u>Cost</u>
<u>Phase I</u>	
1. Storage Building & Restrooms	\$ 25,300
2. Lift Station	1,500
3. 6" Sewer Line	3,960
4. Water Line	1,200
5. Wood Dock	1,500
6. Revetment Stone	<u>2,975</u>
Sub-Total	\$ 36,435
Contingencies (20%)	<u>7,287</u>
Total Construction Cost	\$ 43,722
Engineer & Design (8%)	3,617
Supervision & Admin. (7%)	<u>3,161</u>
Total Phase I Cost	\$ 50,500
<u>Phase II</u>	
7. Parking Lot	\$ 15,280
8. Bulletin Board	200
9. Direction Sign	300
10. Observation Platform	10,000
11. Sod	6,605
12. Trees	2,250
13. Project Sign	300
14. Wood Chip Walk	1,800
15. Fencing	1,620
16. Gate	<u>450</u>
Sub-Total	\$ 38,805
Contingencies (20%)	<u>7,761</u>
Total Construction Cost	\$ 46,566
Engineer & Design (8%)	3,705
Supervision & Admin (7%)	<u>3,229</u>
Total Phase II Cost	\$ 53,500
<u>                  </u>	
Total Cost (Phases I & II)	\$104,000

Cost allocation would be 50/50 with the project sponsor  
(State of Michigan, Michigan Department of Natural Resources).

Non-Federal Cost	\$ 52,000
Federal Cost	<u>52,000</u>
Total Cost	\$104,000

\*Extracted from the Corps of Engineers, Master Plan  
Crooked River Lock & Weir, Michigan, June 1977.

FILMED

1984